The Electrical Industry's Weekly Magazine

August 19, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication

Modern Methods Cut Plant Distribution Costs

...Page 81

Utility Participation Jumps 100% in "Live Better Electrically" Page 77

UNIVERSITY MICROFILMS
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ANN ARBOR MICH

You'll find the answer in the 30- and 40-year operating records of Texaco-lubricated turbines. The oil to give you extra protection throughout an extra-long service life is *Texaco Regal Oil R&O*.

Texaco Regal Oil R&O keeps turbines running clean . . . bearing temperatures normal and governor response instantaneous. In other words, it provides your turbine with an extra margin of safety.

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A Texaco Lubrication Engineer will be glad to help you select the one designed for your turbine. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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FOR ALL TURBINES

Electrical World

Vol. 148, No. 8 August 19, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT EVENTS

TVA Outlook–An Era of Transition?
Death of Board Member Raymond Paty, pigeon-holing of bond-financing bills are factors portending change.....p 70

GENERATION

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Baltimore G&E study shows how the two can be integrated to be started and completed at the same time.....p 88

TRANSMISSION

String Line on Towers with Live 345 Kv
Safety is assured by grounding pulling cable, conductors, and tension-stringing equipment at Appalachian EP.....p 84

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Prefab Fittings Join Aluminum Bus
Welded tubing bus and prefab fittings cut cost on standardized substation design by Utah Power & Light.....p 86

INDUSTRIAL

Aluminum Cable Saves on Plant Distribution
Installed in ladder racks and easily worked, the cable trims material and labor costs for 550-v and 6.6 kv.....p. 81

SALES

"Live Better . . . Electrically" Industry Report
Utility participation jumps 100%, manufacturing support jumps 400% during national program's second year.....p 77

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Inspecting a cable with Okosheath Protective Covering after 7 years of operation in a manhole on Brunot Island frequently flooded with contaminated water. Removal of fireproofing showed the cable unaffected by electrolytic corrosion.

How Duquesne Light Company solved lead-sheath corrosion

Duquesne's Pittsburgh generating station on Brunot Island in the Ohio River had long been plagued with cable failure due to electrolytic corrosion of lead sheaths. River and rain water seepage through cinder fill caused this electrolytic action. Since it was impossible to do away with the cinder fill, the only solution was a cable not vulnerable to corrosion. Okosheath Protective Covering supplied the answer. When bonded by vulcanization to an Okometal alloyed lead sheath, this tough jacket of reinforced Okoprene provides a dual-sheath protection that prevents chemical and electrolytic corrosion and possesses greater fatigue resistance than plain lead sheath. So pleased was Duquesne that existing cables for the 50 distribution circuits originating on the Island were pulled out and replaced with protective sheath cable—30,000 feet in all. A large part of this had Okometal Sheath with Okosheath Protective Covering.

Since completion of the change to protective sheath cable, there has not been a single cable failure due to electrolytic corrosion despite the fact that water and acids are always present in the manholes and duct system. Duquesne considers their problem to be completely solved and are quite enthusiastic about the installation. This is understandable when you consider that several regular lead-sheath cables failed at this location after only a short duration.

Okometal-Okosheath cable can double the life expectancy of plain lead-sheathed cables. Why not let your Okonite representative give you full details on this type of cable. Write today to The Okonite Company, Passaic, New Jersey. 4989

where there's electrical power . . . there's **OKONITE CABLE**

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. . . from the publisher

Tool of the Trade

Electrical World is more than just a magazine. It's a tool for the industry to use. Here's how some of our readers are using it:

• A Midwest utility already has had preliminary talks with its state utility commission after reading our story on Virginia Electric & Power Co's new meter-testing-by-sampling method (EW July 15, p 72).

• The sales manager of an Indiana company is awaiting our latest forecast issue for some final figures before he wraps up his own company's five-year load projections. Issue is slated for Sept. 2.

• Engineers in another utility now have their own narrow-base, light-weight, steel transmission tower on the drawing board. Basing their designs on one presented in EW's special transmission report (EW, March 11, p 93) they expect to speed construction schedules, lower material costs.

Our readers reciprocate by helping us, too. A recent editorial on the crane vs power lines dilemma (EW June 3, p 67) brought quick response from Omaha Public Power District. So far this year it has reduced crane-contact mishaps to zero. A story in last week's issue (Aug 12, p. 77) tells how.

Fischer Black

ELECTRICAL WORLD

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An example of Allis-Chalmers

550-BIL Transformer for 161-kv system raises efficiency, cuts weight, size

Here's dramatic proof of progress!

Close manufacturing control is illustrated by this A-C designed machine used to place precisely the tens of thousands of spacers for directing oil flow.

Valuable experience was gained from building and using this 600-kv transformer for test and research.

A few years ago a 46,667-kva transformer with a combination of reduced insulation, corona-free design, high short-circuit strength and quick-break tap changer would have been the sensation of the industry.

Today, as a result of design research and experience, production of transformers like this is a reality.

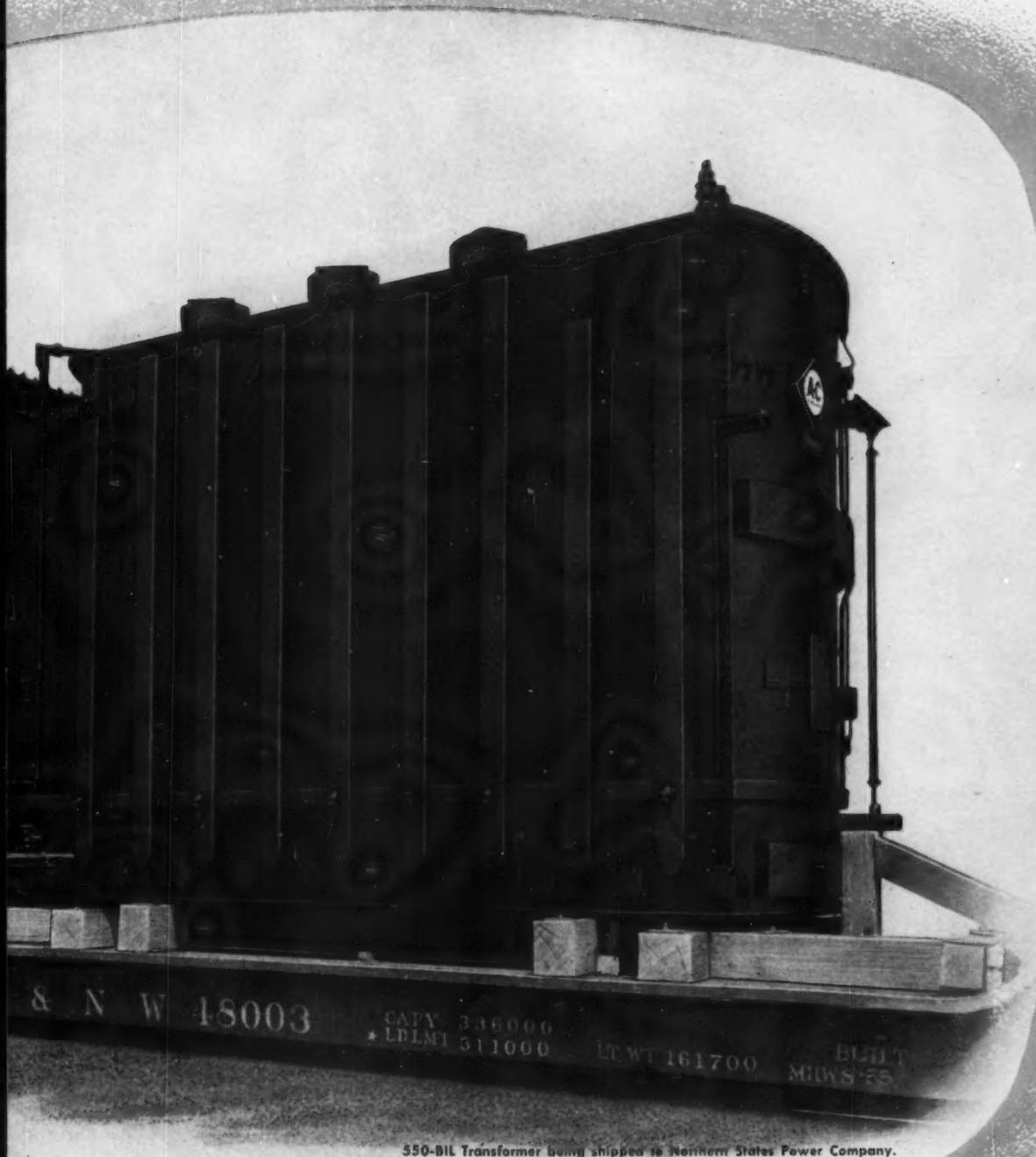
Insulation for this 161-kv transformer would normally be used for 115 and 138-kv units. This reduction of two steps is the result of coordination of modern "corona-free" insulation and improved system overvoltage protection. It makes possible substantial savings in weight, size and cost while increasing efficiency without sacrificing reliability.

Concentrated research on reduced insulation was begun by Allis-Chalmers in the 1930's. After the interruption of World War II, new test methods and manufacturing controls were developed to take advantage of this advanced engineering knowledge. As a result, today's A-C transformer is constructed on a triangle of quality: experience . . . design . . . and close manufacturing control.

For details on the engineering of this interesting design, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

leadership in transformers

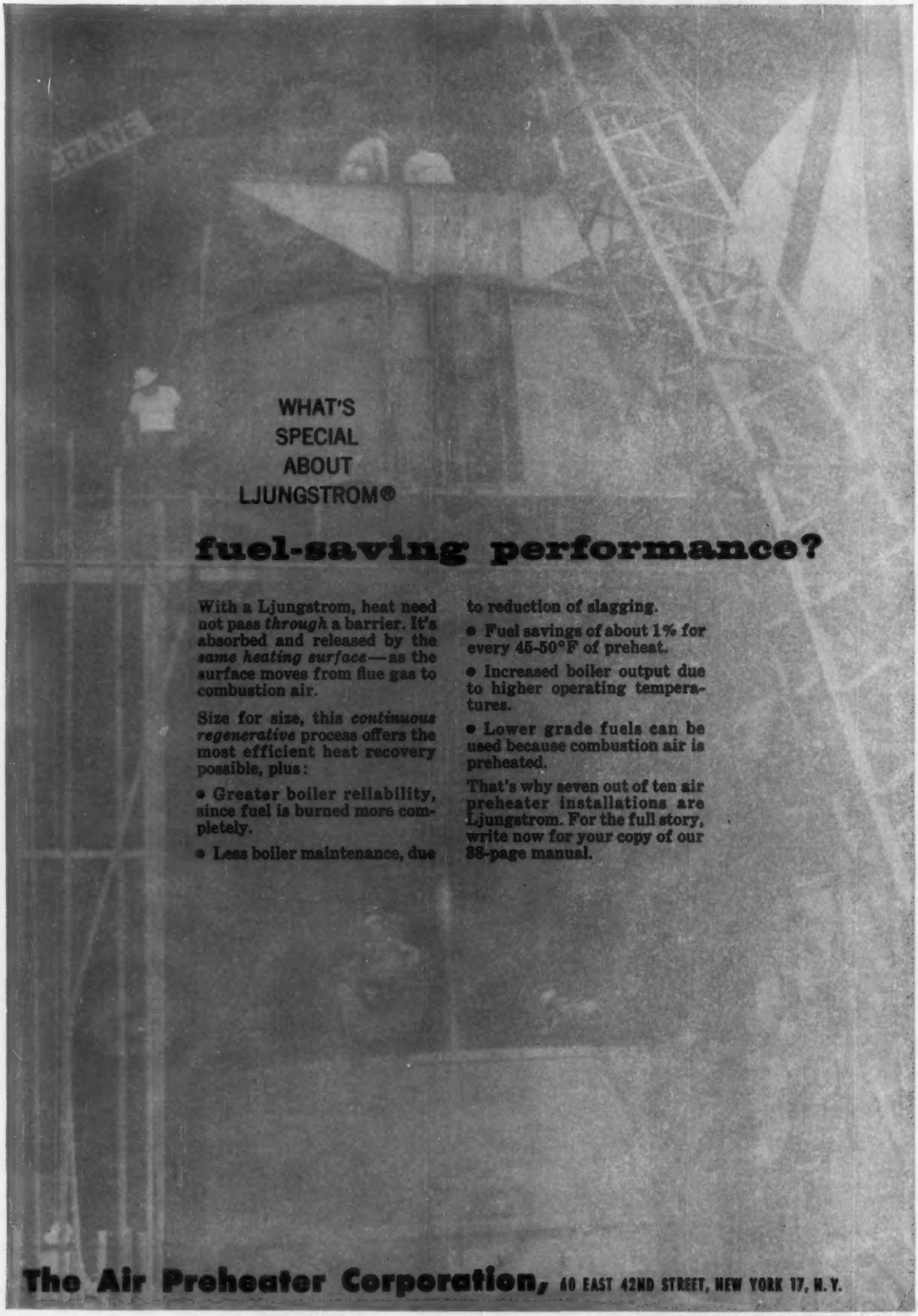


550-BIL Transformer being shipped to Northern States Power Company.

Pioneer Service & Engineering Co.

A-C ALLIS-CHALMERS

A-5510



WHAT'S
SPECIAL
ABOUT
LJUNGSTROM®

fuel-saving performance?

With a Ljungstrom, heat need not pass *through* a barrier. It's absorbed and released by the *same heating surface*—as the surface moves from flue gas to combustion air.

Size for size, this *continuous regenerative* process offers the most efficient heat recovery possible, plus:

- Greater boiler reliability, since fuel is burned more completely.
- Less boiler maintenance, due to reduction of slagging.
- Fuel savings of about 1% for every 45-50°F of preheat.
- Increased boiler output due to higher operating temperatures.
- Lower grade fuels can be used because combustion air is preheated.

That's why seven out of ten air preheater installations are Ljungstrom. For the full story, write now for your copy of our 38-page manual.

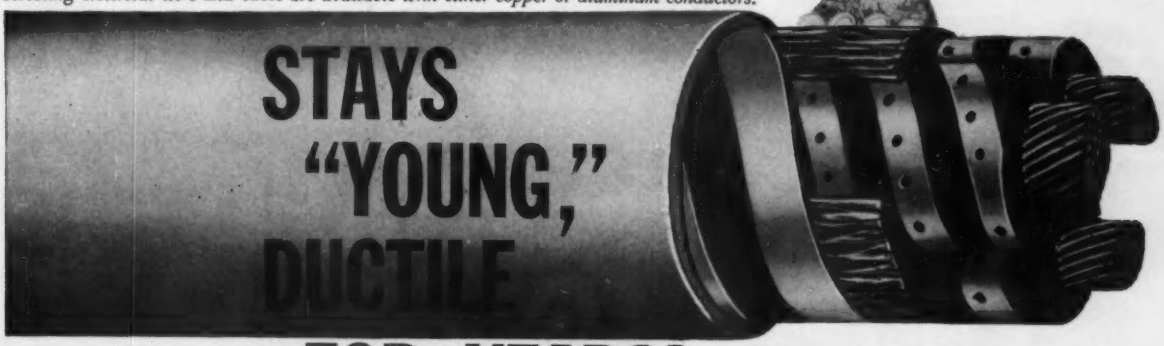
The Air Preheater Corporation, 60 EAST 42ND STREET, NEW YORK 17, N. Y.

NO AGE-HARDENING PROBLEMS...

TELLURIUM LEAD ALLOY SHEATH...

ON ROEBLING PAPER POWER CABLE

Roebling electrical wire and cable are available with either copper or aluminum conductors.



FOR YEARS!

Even after 5¼ years' aging—as proved by actual test—age-hardening is negligible in Roebling's special Tellurium Lead Alloy Sheath.

That's just one of the advantages of this new sheath that gives longer, better service. Excellent resistance to creep and fatigue are others. Combine the exceptional *outer* qualities of this sheath with the careful *inner* construction of Roebling Paper Power Cable and a unique, serviceable cable is the result.

Wherever maximum service life is required, specify Roebling Paper Power Cable with Tellurium Lead Alloy Sheath. For complete information, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

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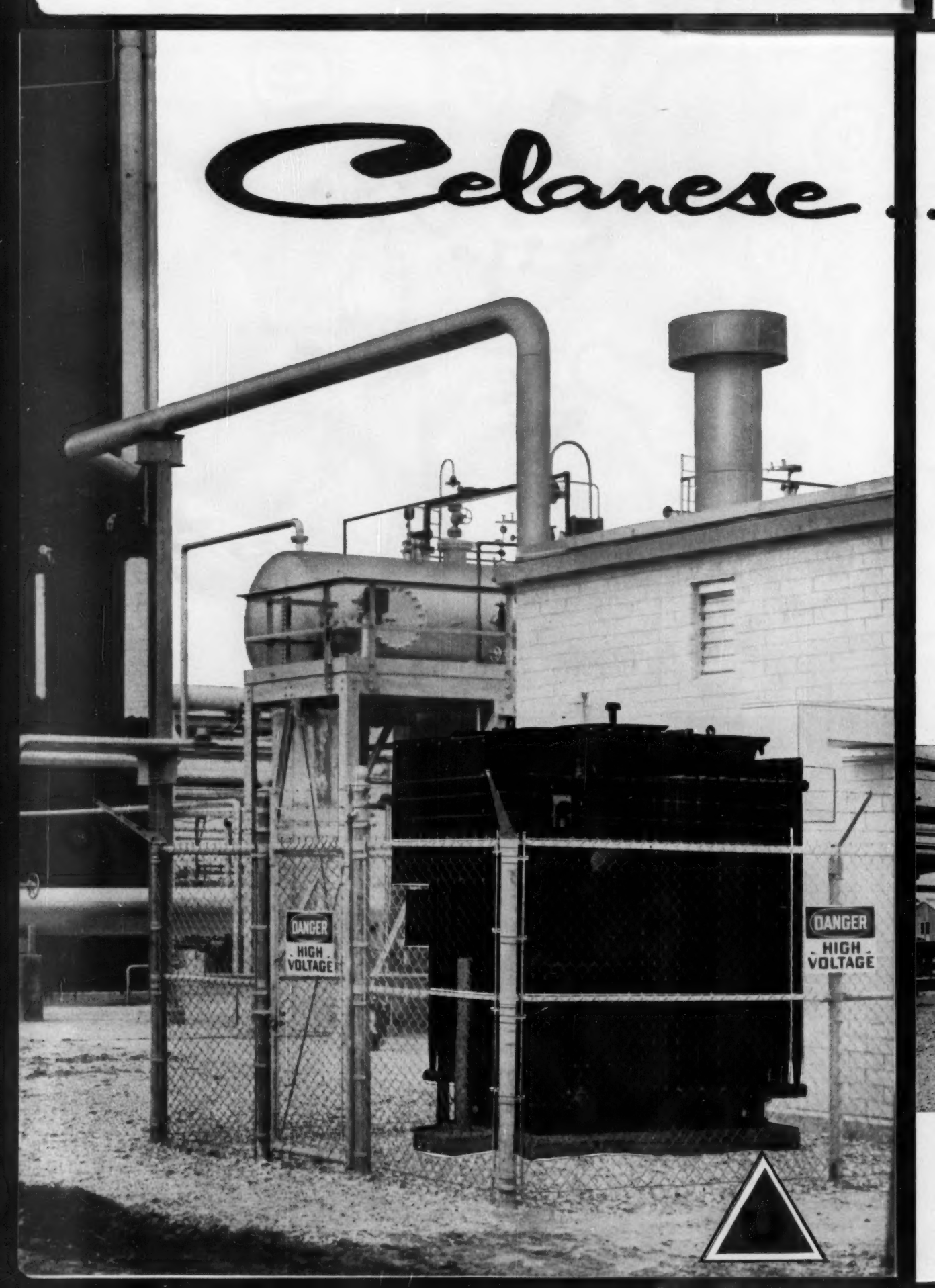
Subsidiary of The Colorado Fuel and Iron Corporation


Celanese
DANGER
HIGH
VOLTAGE
DANGER
HIGH
VOLTAGE

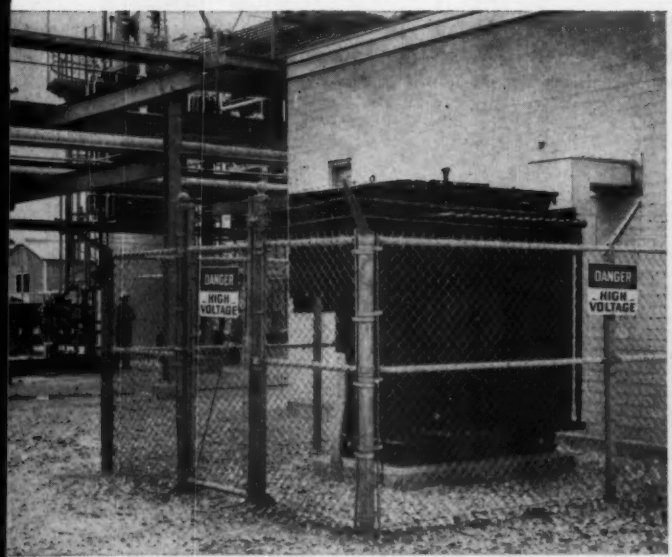
. uses UPTEGRAFF
load center transformers in expanding plastics division

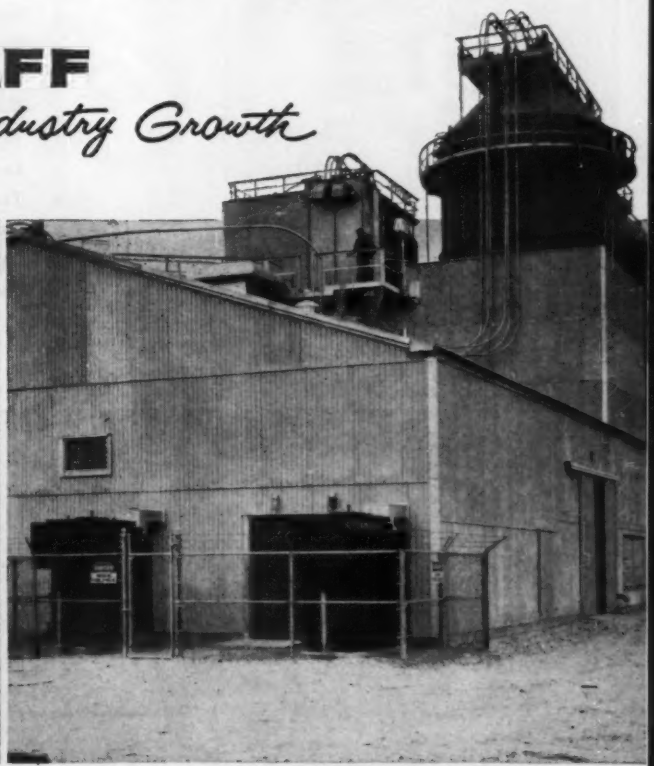
From Maine to Texas, you'll find Uptegraff transformers being installed in new or expanding industries. In the case of Celanese Corporation, Uptegraff load center transformers provide power for a new plant of the plastics division. Located near Houston, Texas, this plant produces polyethylene.

For more than thirty years, Uptegraff has maintained aggressive leadership in the making of transformers—by constant research and development, new and expanding facilities, and manufacturing know-how. Uptegraff transformers on the job at Celanese is another example of how Uptegraff keeps in step with industry growth. These transformers, located near the center of the load, assure considerable savings in total cost and improve the power characteristics. Being liquid filled, they provide the maximum in efficiency, insulation strength and overload capacity.

Uptegraff makes a complete line of liquid-filled (oil or askarel) and dry type—(Class B or Class H insulation) load center transformers. Including the latest design features, these transformers insure easy installation, long life and low maintenance. In addition, Uptegraff manufactures Power, Distribution, Instrument and Specialty transformers. Designed and built to more than meet NEMA, AIEE and ASA requirements, they are *fully guaranteed*. Write for descriptive literature *today*.

UPTEGRAFF
In Step with Industry Growth





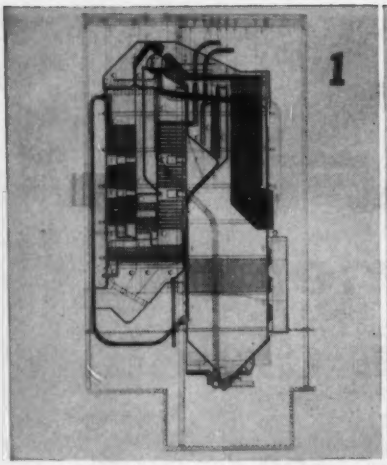
This Uptegraff transformer (above) three-phase, liquid-filled, Type OLC-oil immersed, is rated at 750 kva, 12,500 to 480 volts.

The Uptegraff liquid-filled transformer at the left is rated at 1000 kva, 12,500 to 480 volts—helps supply the power requirements for the new Celanese Plastics Division plant.

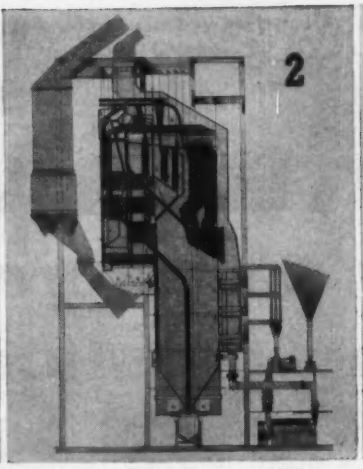
These two Uptegraff transformers are each rated at 1000 kva, 12,500 to 480 volts.

Electrical and Engineering Contractor: C. F. Braun & Co.
1000 South Fremont Street
Alhambra, California

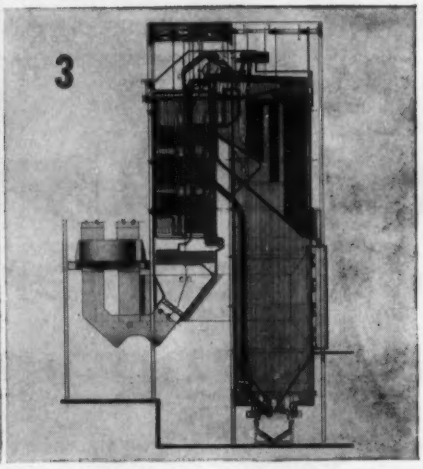
R. E. UPTEGRAFF MANUFACTURING CO.
Scottdale, Pennsylvania



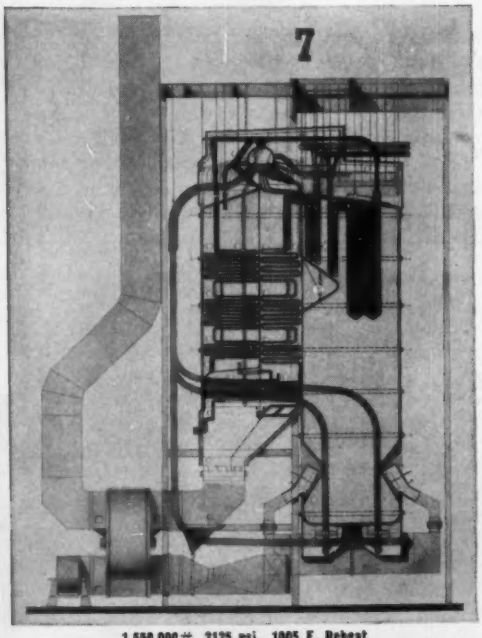
600,000#, 1700 psi., 1000 F. Reheat



1,000,000#, 2075 psi., 1005 F. Reheat



690,000#, 1650 psi., 1000 F. Reheat



1,550,000#, 2125 psi., 1005 F. Reheat
TURBO FURNACE

RILEY CENTRAL

that cover a wide range of

1. Florida Power Corporation – Oil
2. Public Service Company of Indiana, Inc. – 4 Units – Coal
3. Central Illinois Light Co. – Coal
4. Minnesota Power & Light Co. – 2 Units – Coal, Future Oil, Gas
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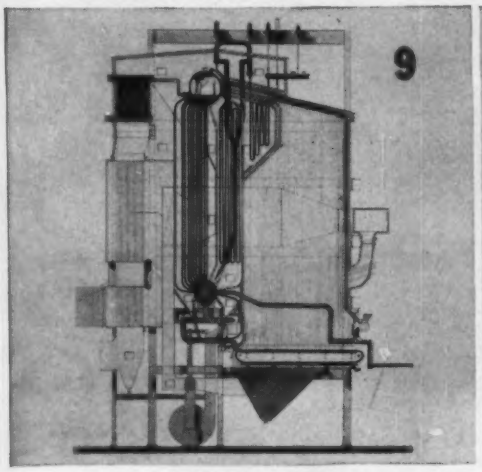
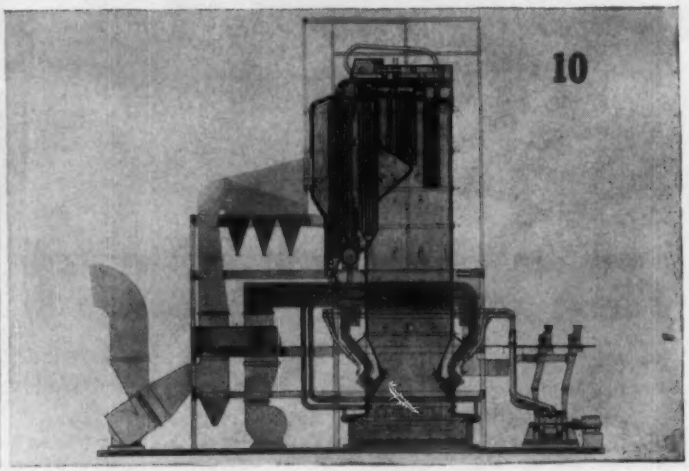
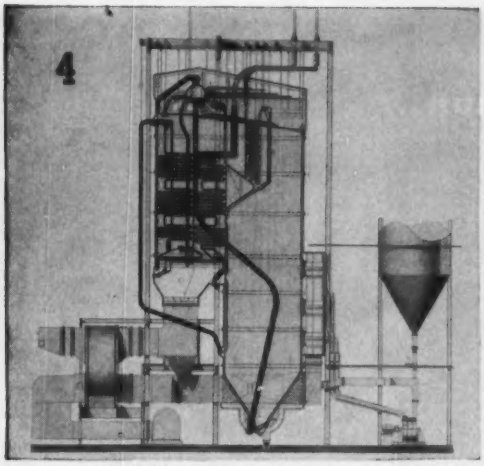
6. Texas Electric Service Co. – Oil, Gas
7. Louisiana Power & Light Co. – Gas, Future Oil, Coal
8. Texas Electric Service Co. – Gas, Oil, Future Coal
9. Montana Dakota Utilities – Lignite
10. Delaware Power & Light Co. – 3 Units – Fluid Coke, Gas, Oil, Coal
11. Central Louisiana Electric Co. – 2 Units – Gas



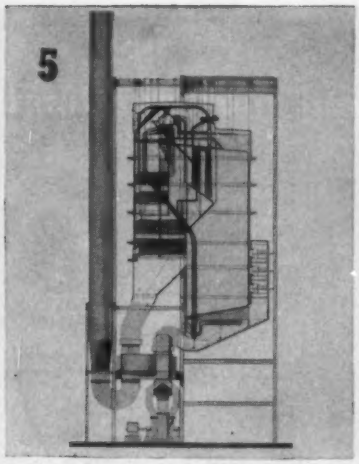
250,000#, 1825 psi., 905 F.



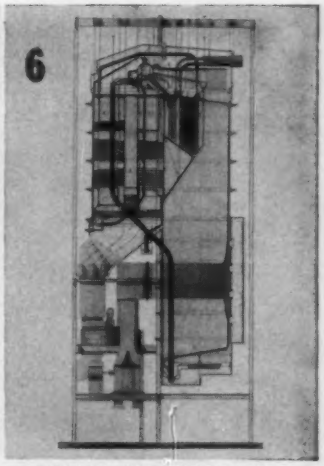
500,000#, 1425 psi., 950 F. TURBO FURNACE



500,000#, 1725 psi., 1005 F. Reheat



1,050,000#, 1725 psi., 1005 F.



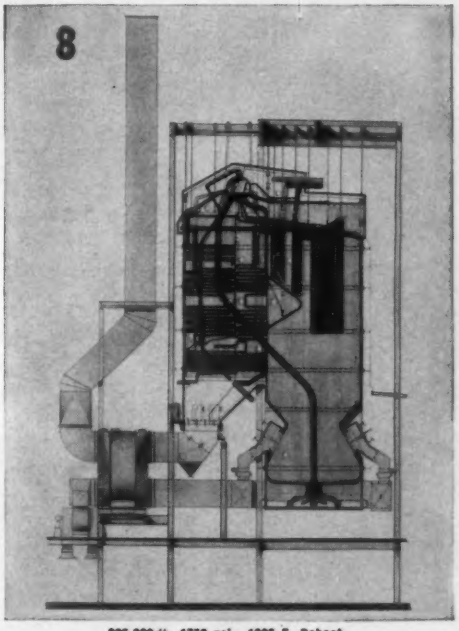
1,200,000#, 2125 psi., 1005 F. Reheat

STATION INSTALLATIONS

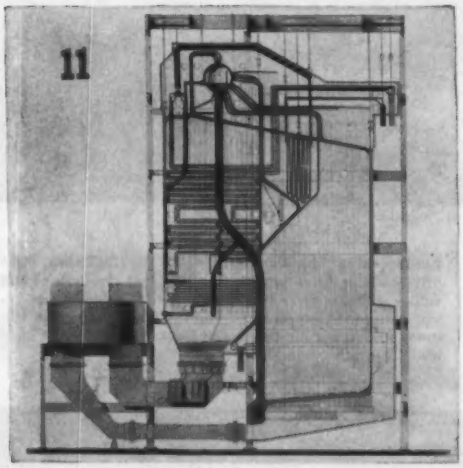
typical operating characteristics

These Riley Central Station Boiler designs are typical of many units that have been sold in recent years to a growing list of public utilities. This gratifying acceptance is a result of not only dependable and efficient operating characteristics, but because Riley, with its wide range of fuel burning products and the recent development of the TURBO FURNACE for multi-fuels, can offer the most economical solution to virtually any fuel burning situation.

Riley Boilers and Fuel Burning Equipment are *Designed, Manufactured, Erected and Serviced* under a single contract.



825,000#, 1750 psi., 1005 F. Reheat
TURBO FURNACE



350,000#, 1650 psi., 1005 F. Reheat

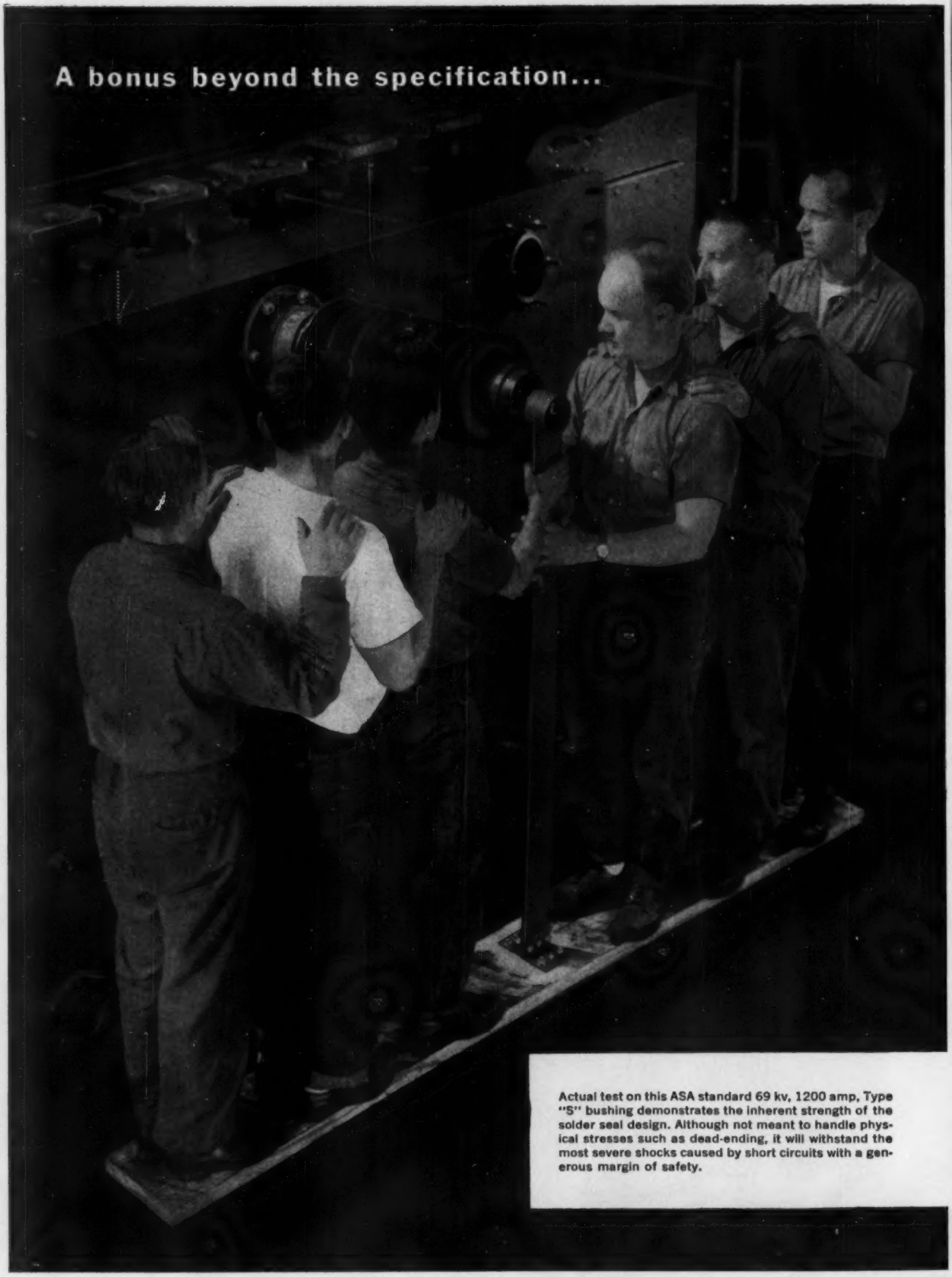
A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY

Stoker Corporation

WORCESTER, MASSACHUSETTS

Sales Offices: Worcester, New York, Philadelphia, Buffalo, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Houston, Denver (Englewood), Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.



Actual test on this ASA standard 69 kv, 1200 amp, Type "S" bushing demonstrates the inherent strength of the solder seal design. Although not meant to handle physical stresses such as dead-ending, it will withstand the most severe shocks caused by short circuits with a generous margin of safety.

SOLDER SEAL . . . stressed to the ultimate without damage

For transformers and circuit breakers . . . durability like this can't "just happen" . . . it has to be planned

Engineered to withstand severe electrical, thermal and mechanical stresses, Westinghouse condenser bushings can take far more punishment than they will ever get.

The result of fifty years' field experience plus continuous research, Westinghouse Type "S" bushings needed no basic construction change to meet ASA standards.

Superiority has been proved in service with such features as:

Unequaled Mechanical Strength—provided by exclusive Westinghouse solder-sealed construction, together with one-piece, wet-process porcelain casing. This allows deflection under severe short circuit stresses without damage to sealed joints.

High Dielectric Strength, Low Power Factor—provided by numerous conducting foil layers, and generous thickness of high-grade insulating paper.

Extra Thermal Strength—assured by liberal conductor cross-section and low dielectric loss. High thermal capacity, no hot spots.

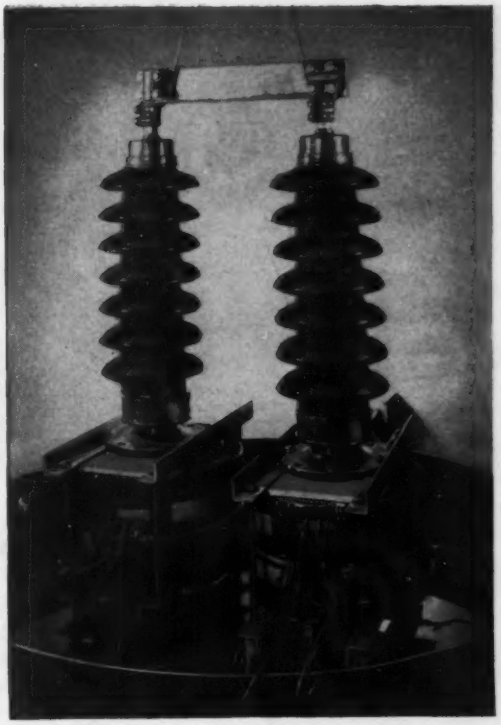
Absolute Sealing Against Moisture—provided by solder seal construction which eliminates gasketed joints. High-viscosity plastic filler gives additional internal protection by providing a positive bond which prevents voids at all temperatures.

Freedom From Corona—maintained by uniform voltage gradient and controlled by testing every bushing.

For complete information about Type "S" condenser bushings, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70815

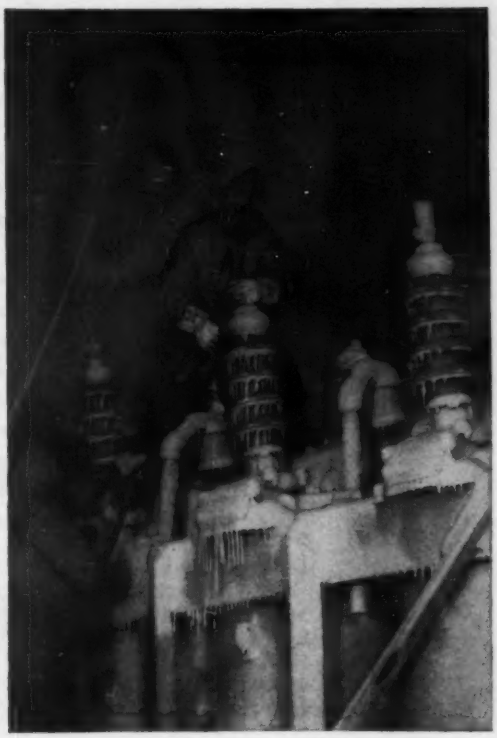
YOU CAN BE SURE . . . IF IT'S

Westinghouse



Exceptionally severe thermal stability test fails to decrease bushing strength. Tested by 12 hours immersion in hot oil at full rated current, one hour at twice normal voltage.

Work-worthy under any temperature extreme. In the Type "S" bushing, exclusive Westinghouse filler plastic eliminates voids at all points and at all temperatures down to –60°F.



Four more utilities place

CONTROLLED

REPEAT ORDERS

Repeat orders, always the most conclusive indication of user satisfaction, reveal the remarkable acceptance of the C-E Controlled Circulation Boiler. Here are the facts: *All* the companies listed below have placed repeat orders. They represent 65 per cent of all purchasers. Two of the companies have placed seven contracts each and three others, four contracts. The list as a whole averages better than three contracts per company.

Boston Edison Company
Central Hudson Gas & Electric Company
Cincinnati Gas & Electric Company
Cleveland Electric Illuminating Company
Commonwealth Edison Company
Consumers Power Company
Detroit Edison Company
Duke Power Company
Houston Lighting & Power Company
Illinois Power Company
Kansai Electric Power Company
Kansas City Power & Light Company
Kansas Power & Light Company
Niagara Mohawk Power Corporation
Northern Indiana Public Service Company
Pennsylvania Electric Company
Philadelphia Electric Company
Potomac Electric Power Company
Rochester Gas & Electric Corporation
South Carolina Electric & Gas Company
Tennessee Valley Authority
Virginia Electric & Power Company
Wisconsin Electric Power Company

their FIRST ORDERS for

CIRCULATION BOILERS

Five years ago, the Virginia Electric & Power Company initiated a major new trend when it placed in service a C-E Controlled Circulation Boiler.

The rapidity with which this trend has developed is evidenced by the fact that orders for C-E Controlled Circulation Boilers now total *111* units having an aggregate capacity of more than

19,300,000 kw

Recently, the following utility companies have placed their first orders:

	Station	No. of Units	Kw Capacity per unit
Central Illinois Public Service Co.	Meredosia	1	200,000
Consolidated Edison Co. of New York	Astoria	1	340,000
Florida Power & Light Co.	Port Everglades	2	240,000
Pennsylvania Power & Light Co.	(new station)	1	330,000

The *repeat order* list opposite reveals the nationwide acceptance of the C-E Controlled Circulation Boiler. The rapidly growing preference for this boiler is the result of its outstanding performance record, particularly with respect to high availability, and the widespread recognition of its special suitability for high pressures. This preference is particularly notable in the 2400-lb pressure range where the C-E Controlled Circulation Boiler leads the field by a wide margin with 36 units installed or on order for a total capacity of 6,600,000 kw.

COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N.Y.

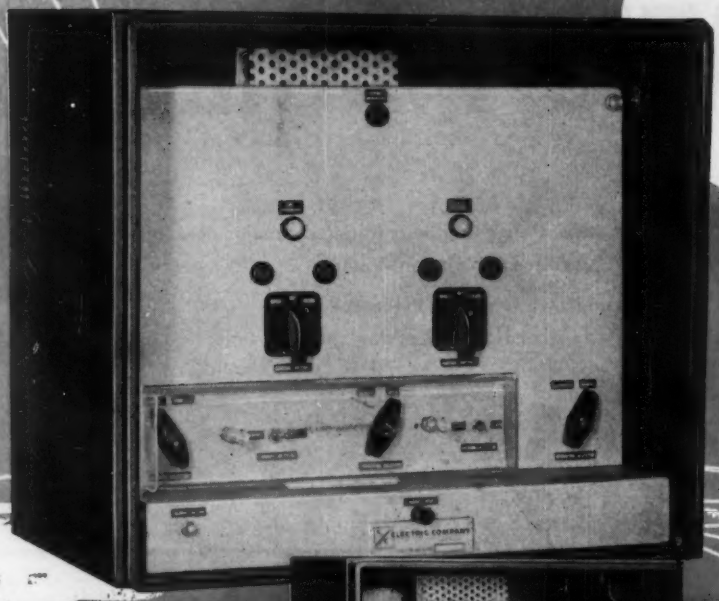
C-111

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

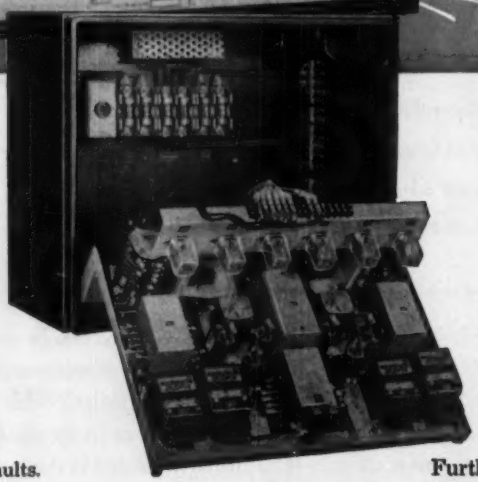
Now for "Preferred-Emergency" Switching

an Off-the-Shelf

AUTOMATIC TRANSFER PANEL



With *Any Desired* Throwover Scheme ...at the *Flip of a Switch!*



A Flip of the Switch Gives You:

- Choice of making either source preferred.
- Choice of automatic or manual (semi-automatic) return.
- Adjustable time delays —range up to 10 minutes.
- Optional manual operation of line switches.
- Choice of returning: in either open or closed transition (with or without paralleling).
- Optional lockout on bus faults.

Other Unique Features:

- Indicating lamps for switch positions, live sources, and lockout action.
- Alarm to prevent leaving panel set on "manual operation."
- Transparent cover over selector switches prevents unintended changes in settings.

Saves Time and Money

You don't have to design and build (or negotiate for) — your special automatic transfer panels in order to get the special specific throwover schemes you need. The new S&C Automatic Transfer Panel will give you any or all throwover options... selector switches give the scheme you want!

With this new stock panel you can eliminate the engineering and correspondence involved in getting custom-built panels.

Furthermore, you are sure of getting what you want today; tomorrow you can change your mind, and later you can revise the scheme—still using the same transfer panel. Imagine! You can order your panel ahead of time, before specifications are settled.

— Buy from our stock for your stock —

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSE • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶ **Two key issues are nearing the boiling point** in California: the natural gas supply problem and the method of handling rapid depreciation.

Look for an early decision on the Mountain Sheep-Pleasant Valley project. It should be forthcoming from FPC soon.

Keep your eye on the Arnold Jones appointment to TVA. If the Senate doesn't act on the confirmation, there may not be a recess appointment by Eisenhower, say some Washington observers (p 70).

LATE NEWS ▶ **TVA supporters in Washington are up in arms** about the proposal to sell TVA power facilities to the 150 communities which the agency now serves (p 72). "It is dirty pool, coming at this time," asserted Sen Estes Kefauver, who charges the proposal was designed to defeat the TVA self-financing bill in the House.

Production of inexpensive "heavy water" is being planned by the National Bureau of Standards at its pilot plant now going up in Boulder, Colo. NBS hopes to reduce the present high cost of production by distilling hydrogen, an untried method.

Florida P&L plans to file a complaint against the rate base of $302 million recommended by the state's Railroad & Public Utilities Commission staff. FP&L seeks a rate base $32 million higher. But proposed lower electricity rates, which would bring annual profit from about 8% down to 6.98%, is not protested.

Chances are that the Senate will confirm the appointments of John S. Graham and John F. Floberg as AEC members sometime this week. The two appointees, both former Truman aides, were okayed unanimously by Senate members of the Joint Committee on Atomic Energy last week.

FPC approves increased rates for electric co-ops and other customers of Southwestern Power Administration. Boost would up wholesale rates from 5.51 to 6.97 mills per kwhr. However, FPC refused to hike rates in the SPA and Arkansas P&L-Reynolds Metals pact.

AEC finally completes formal hearings on the constructon permit issued to Power Reactor Development Co for a fast breeder reactor at Monroe, Mich. Safety of the project had been questioned by three labor unions. Decision by AEC will come late this year.

Congratulations . . . Newly named vice president of Narragansett Electric Co is Edward G. Twohey . . . E. F. Johnson and D. R. Hoopes are appointed to assume the duties formerly held by Southern Nevada Power's D. D. Smalley, retired . . . George L. Morris rises to manager of electric operations for Northern Indiana Public Service . . . Iowa P&L's new purchasing agent is Rex Jorgensen . . . The recently organized Southwest Atomic Energy Associates has as its first president J. Robert Welsh, also president of Southwestern G&E.

ELECTRICAL WEEK

A TWO-MINUTE

WASHINGTON ▶ **What's in the cards for TVA's future?** The turbulent 23-year life of the agency reaches another crossroads. While Congress was tangling with the controversial TVA financing and expansion issue, the sudden death of a board member reduced the board to one and further complicated the agency's future. Meanwhile, the sale of TVA power facilities to the 150 communities which TVA now serves is being proposed by Walter von Tresckow, whose name figured prominently in the Dixon-Yates controversy (p 70).

EVENTS ▶ **Partnership scores again** as Pacific G&E and two irrigation districts get ready to put $52-million Tri-Dam Project on the line. The project's three new district owned power plants will provide PG&E with 81 Mw installed capacity. PG&E, on the other hand, will pay $115 million from now until the year 2005 for power from falling water (p 74) . . . New Jersey P&L is talking seriously of a combined pump-storage, water-storage project which would boost the utility's capacity by 75,000 kw. The plan hinges on agreement with Jersey City over water rights (p 73) . . . After seven long years of fighting, Niagara development may get the go-ahead signal any day now. All the measure needs is Ike's signature (p 76) . . . A bill which would end rapid tax amortization in 1959 passes the Senate, is now before the House (p 76).

GENERATION ▶ **Large generator rotors can be prewarmed safely** and integrated with turbine starting procedures. This is possible as a result of an operating guide based on an analysis of heat flow and temperature distribution recently made by Baltimore Gas & Electric. Accuracy has been substantiated by field tests (p 89) . . . A hacksaw blade and a welding rod are discovered to be the mysterious causes of an unusual series of boiler tube leaks plaguing Ohio Power (p 98).

TRANSMISSION ▶ **From the "Nothing's Impossible" department** . . . Appalachian Electric Power strings a second 345-kv line on towers carrying a live 345-kv circuit. Safety was assured by use of tension stringing equipment and by grounding pulling cable and conductors (p 84).

SUBSTATIONS ▶ **Utah P&L's aluminum bus for standardized substations boasts** two cost-cutting components: Welded aluminum tubing and prefabricated fitting. Erection time also is reduced (p 87) . . . The line-dropping capability of a disconnect switch may be boosted by new vacuum-tube interrupters, recent Union Electric tests show. These units replaced the quick-break interrupters on a standard 115-kv, 1,200-amp disconnect switch (p 92).

INDUSTRIAL ▶ **Lower material and labor costs are advantages** of aluminum armored cable in ladder-type racks recently installed in supply system of expanded paper mill. Other benefits: Easy handling, room for future expansion (p 81).

PREVIEW OF THIS WEEK'S ELECTRICAL WORLD

SELLING ▶ **Highlights from "Live Better . . . Electrically's" Industry Report** include a doubling of utility participation and a jump in the number of supporting manufacturers of more than 300% from 1956 to 1957. LBE, now rounding out its second year, appears to be gaining greater acceptance both in the electric utility industry and among consumers **(p 77)**.

If you want to be sure the homes in your area are adequately wired, sell the idea to the builder. This philosophy has paid off for Cincinnati Gas & Electric, which recently persuaded a builder to incorporate AW in a new development rising in the city's suburbs. For the story on how CG&E achieved this, see **page 112** . . . Dignified advertising on 'miniature air conditioners' that go to church wins favorable reaction from parishioners in Quincy, Ill. **(p 115)**.

MANAGEMENT ▶ **Last week's hike in money rates,** intended to put the damper on inflation, has many people asking: How will capital investment be affected? Even before the hike, the big word had been caution—in business borrowing, inventory policy, credit buying **(p 143)**.

Meanwhile, a treasury official sees lower interest rates in a year or so. And a senior market consultant advises utilities that now is the time to consider convertible securities **(p 145)**.

PEOPLE ▶ **New post of senior vice president** of Atlantic City Electric goes to Carl O. Carlson, while James P. Hayward becomes VP-electric operations . . . Georgia Power Veep John F. Pennington takes over new duties as vice president-engineering and operations . . . At Southern Co, James H. McGuire becomes VP and L. H. Jaeger is made VP and treasurer **(p 152)**.

MANUFACTURERS ▶ **Two of the nation's largest** bushing-mounted load-tap-changing mechanisms are slated to be installed at Niagara Mohawk's Gardenville station. They were designed to make high-voltage load tap changes on two 125,000-kva auto transformers without using a series transformer **(p 134)** . . . A three-section railroad car brings Ohio Power its first shipment of a 394,000-lb, 200-Mva transformer **(p 136)** . . . Burndy Corp puts two traveling display units on the road in order to facilitate close-up demonstrations of connection techniques **(p 136)**.

NEW EQUIPMENT ▶ **New compression tool is pint-sized but powerful.** Measuring only 9.5 inches long and weighing 20 oz., it has the same leverage as conventional tools two or three times as large . . . Aluminum connectors just introduced provide high contact pressure with low connector stress . . . New hookstick switch can be mounted in either vertical or underhung positions and is assembled on standard duty insulators **(p 120)**.

ENGINEERING TRENDS

Electronic circuit devices cut time lag of auxiliary relays to make tripping time of microwave systems with high-speed fault-detecting relays fast enough to take full advantage of the fault-clearing capabilities of 3-cycle circuit breakers. Typical circuitry uses silicon or germanium rectifiers to perform the blocking and sequencing functions usually sought in the auxiliary relays.

Regenerative voltage from inertia and self-excitation of motors makes under-voltage relays unreliable as the control for automatic transfer to an emergency power source before motors slow to dropout speed. Often regenerative frequency is a better control for motors driving critical industrial loads.

Motor speeds upwards of 40,000 rpm for grinding operations are attained with polyphase squirrel-cage motors approaching a fourth the weight and size of 60-cps motors of similar rating. Such high-cycle motors require little attention for continuous heavy-duty applications. Where duty is less severe, single-phase commutator-type motors are sometimes used with 60-cycle power. In either case, bearing life is prolonged by lubricating with oil blown in as a mist by filtered compressed air.

Utilities and manufacturers are cautious about 2-step reduction in BIL for large power transformers despite the potential savings it offers. Their attitude seems to be one of acquiring experience with 1-and 1½-step reduction already adopted by a growing number of utilities and of watching reports from the few who venture to 2 steps.

Two-step directional-distance overcurrent relays provide accurate and selective protection of subtransmission circuits.

Despite proposals to use dc transmission for the cable between England and France, this form of transmission is not contemplated for wholly overhead lines in England because of the short distances involved.

FROM EDITORS IN THE FIELD

One-half million dollar saving will result from reduction of heat losses in 5½ mile steam line connecting Linden generating station and the Bayway refinery of Esso Standard Oil Co. The large diameter steel pipe will be covered with mineral-wool insulation and jacketed with aluminum sheet. The aluminum sheet will be installed in the field.

Switchgear design shows growing application of new concepts. Among the changes are more extensive use of transistors to control mercury-arc rectifiers, adapting a universal base to power switches of many ratings and use of red flame-retardent insulation to keep fires from spreading.

In O-B's full line of hardware you'll find materials made for your requirements

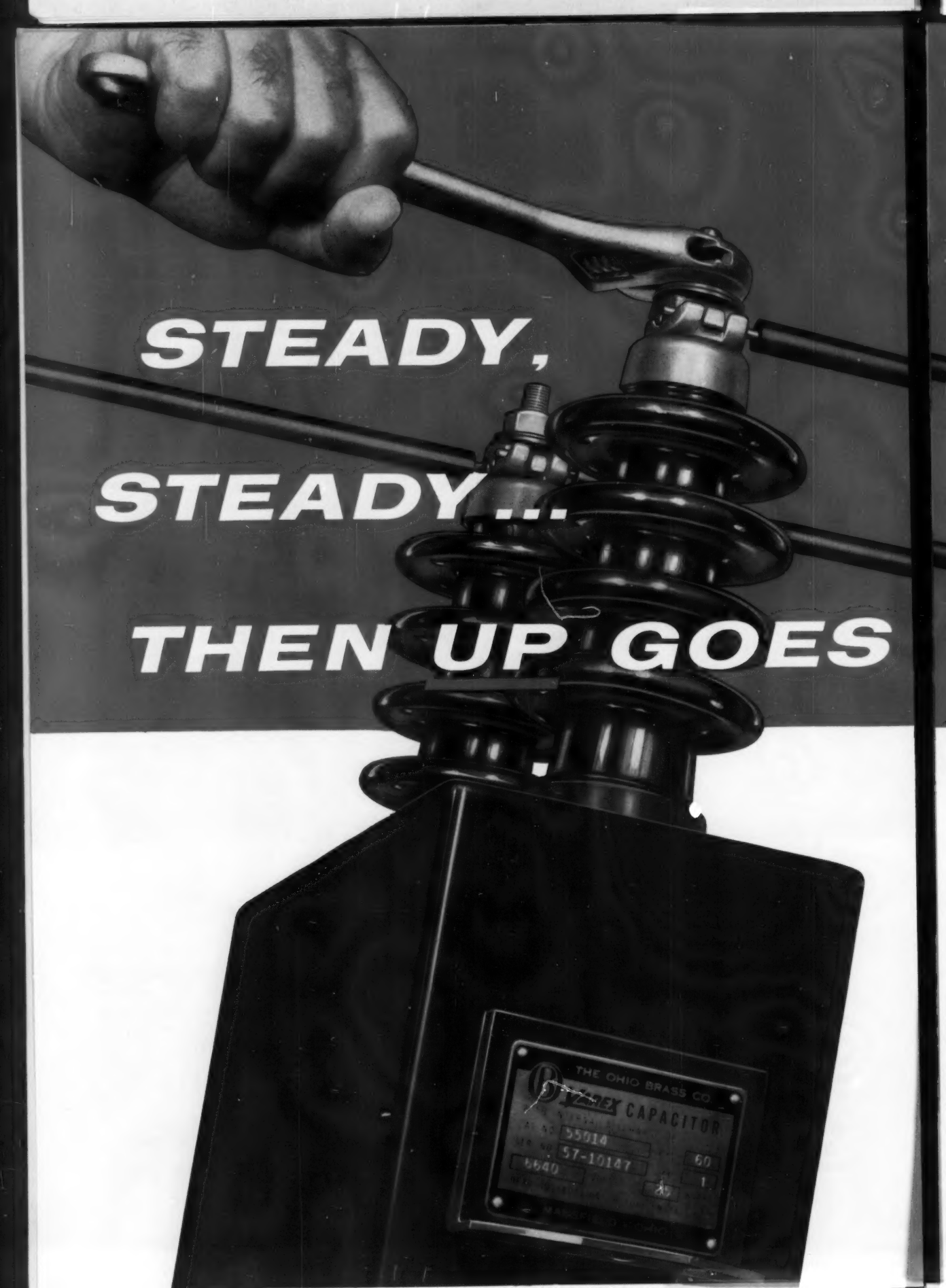
Our only consideration in designing and manufacturing hardware for transmission and distribution lines is what material or method will do the job best at a reasonable cost.

O-B makes clamps and other hardware out of bronze, malleable iron or aluminum. We cast in both sand and in permanent molds. When forging will produce the best product, we forge it. We have the facilities to bend, form, weld or to perform whatever other fabrication technique may be needed.

These facts are important to you in designing and building a transmission or distribution line. You don't have to be concerned about whether one method of manufacture is better than another. Merely select the design that you want and buy from O-B with assurance it's made by the best method out of the best material for your application.

Ohio Brass

OHIO BRASS COMPANY • MANSFIELD, OHIO


STEADY,
STEADY...
THEN UP GOES
THE OHIO BRASS CO.
CAPACITOR
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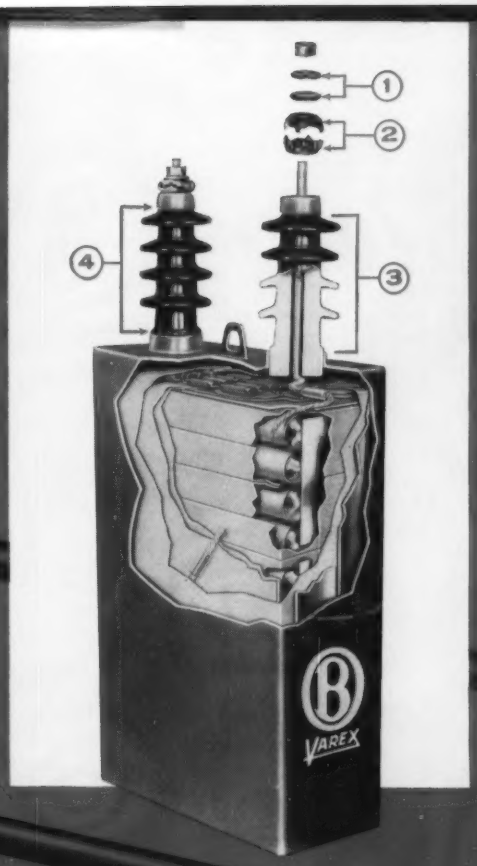


1 Follow-up Pressure On Conductor

Belleville spring washers exert follow-up pressure so there is no relaxing of 1000-pound clamping force, even if conductor "cold-flow" occurs.

2 Identical Clamp Halves

Either half can be used in either position, top or bottom. Stud is staked so that nut will not come off accidentally when conductor is inserted.

3 Long Leakage Distance On Bushings

Leakage distance is well in excess of NEMA standards. Petticoat design promotes natural cleaning by rain. Wet process porcelain comes from O-B's own plant.

4 Solder Joints Are Always Under Compression

The joints between the stainless steel cap and the top of the bushing and between the base of the bushing and the container top are solder sealed in such a way that the joints are always under compression. Temperature change will not affect the method of loading.

THE TORQUE!

It's easy to tell when VAREX terminal nut is tight, but even if over-tightened, all that's lost is a STANDARD nut . . . . . .

You can *feel* and *see* when the terminal nut on a Varex capacitor is tightened properly. Turn the terminal nut with a steady torque for several turns. Then the torque suddenly increases. Looking at the Belleville spring washers, you can see they've flattened.

But suppose the lineman fails to note these two signals. Suppose he goes ahead and over-tightens the nut. No damage can be done to the terminal or the bushing. The nut will strip without damaging the stud threads since the crests have been removed from the threads. True, the nut is stripped, but it is a standard brass nut, readily replaceable from the stock room.

There are many other important advantages of Varex terminal and bushing design . . . the fact that the clamp halves are identical, the long leakage distance on the bushings, the use of a stainless steel cap that loads the bushing porcelain only in compression, to name a few.

If you're interested in the details on Varex terminal design, your O-B district manager will be glad to tell you all about them, or write for capacitor bulletin, 1374-H.

OHIO BRASS COMPANY • MANSFIELD, OHIO

Ohio Brass

Man, those hens are cool

and even more important, they lay more eggs

A Texas college reports that air-conditioning the hen house does more than keep the hens cool. It also boosts egg production by 20 per cent.

We also know that pigs get fat sooner when they have a cool place in summer, and the cows turn out more butter fat when the dairy barn is air conditioned. No doubt the farmer himself is more efficient when he can sleep in an air-conditioned house.

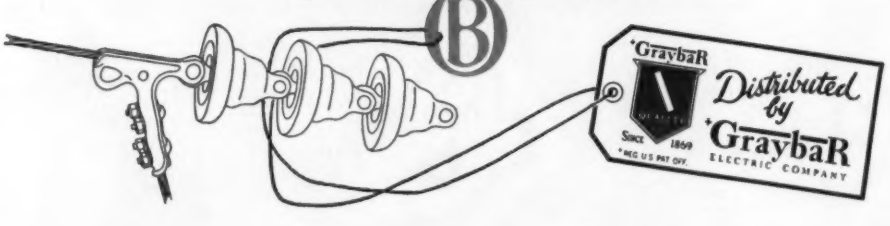
Now that we've made the case for air conditioning, comes the next consideration. It's quite a load builder for your system. Along with the other new appliances, air conditioning equipment will soon have distribution voltages climbing again.

Graybar is ready to help you get ready for the bigger load. You'll find your nearby Graybar house stocks all the O-B insulators and hardware you need for a voltage-raising program. Bring Graybar into the planning soon. After all, we don't want to disappoint those hens when they start clucking for air conditioning. Do we?

OHIO BRASS COMPANY, MANSFIELD, OHIO

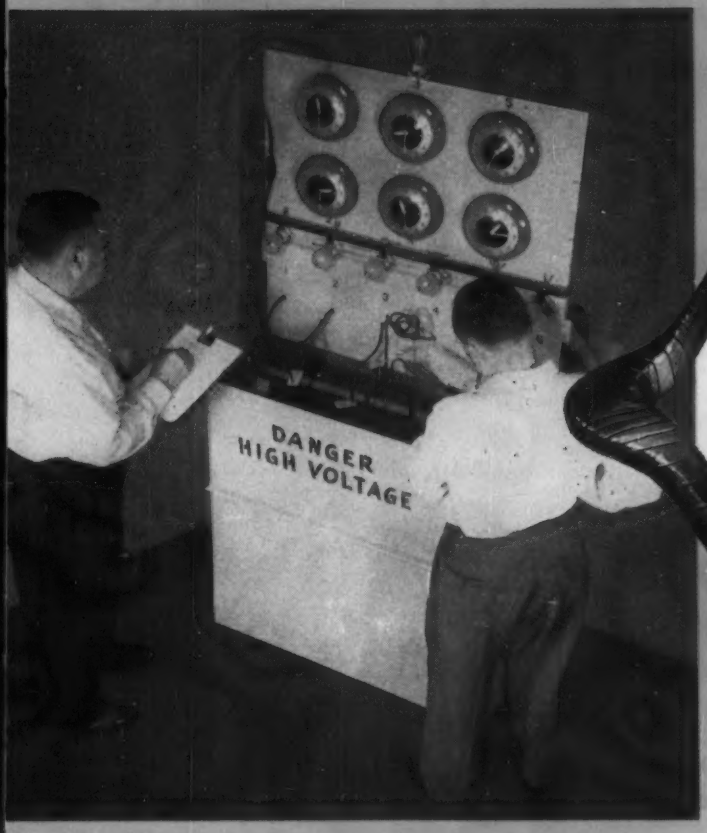
4760-H

Ohio Brass



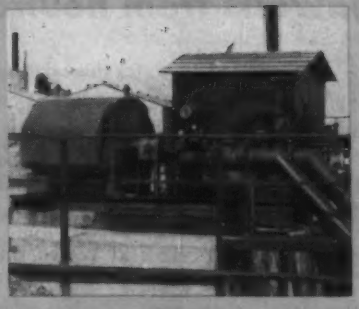
ELLIOTT
Fabri-Seal
INSULATION

not one insulation failure in 8 years . . .



IMMERSION "TORTURE-TEST" evaluates coil insulation longevity

The Elliott immersion "torture-test" (above) was created to evaluate the life expectancy of stator coils. It quickly locates potential trouble spots such as air pockets or entrapped moisture. Countless systems were rejected before a fabricating system was developed which would stand up to the "torture-test" of continuous application of 150% of rated voltage while the coil is immersed in a conducting liquid.



A 1950 installation (right) of an Elliott weather-protected motor with Fabri-Seal insulation.

Developing the Elliott Fabri-Seal insulation system for large induction motors—the system that established the 8-year service record—requires more than new materials and fabrication methods. Accelerated life-testing of hundreds of insulating systems over the years was also involved.

The perfected system—Elliott Fabri-Seal Coil Insulation—has been used in 1,900,000 hp of large squirrel-cage induction motors now in service all over the country. These machines have been operating since 1948 *without one single insulation breakdown*—an unprecedented service record. For details, contact the Elliott Company, Ridgway, Pa.

ELLIOTT Company

R7-27

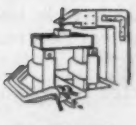
FIVE OTHER REASONS WHY ELLIOTT "FABRI-SEAL" INSULATION INSURES LONGER SERVICE LIFE

MYLAR*-BACKED MICA SEALS COIL SLOT SECTIONS

*Dupont trademark

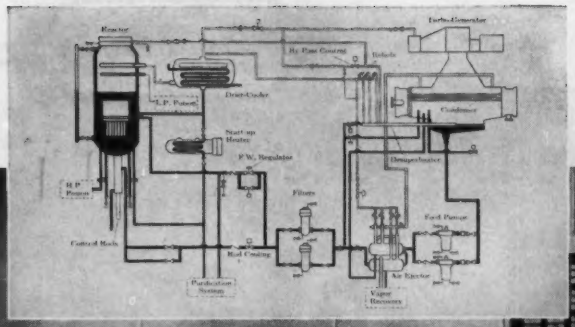
SEALED AT ALL VULNERABLE POINTS

VACUUM AND PRESSURE IMPREGNATION



TURN-TO-TURN TESTED AT HIGH SURGE VOLTAGES

EVERY STATOR IMMERSED AND BAKED



In EBWR, water boils to steam within the reactor vessel. This eliminates heat exchange equipment from plant design.

L&N instrument system guides operators of first U.S. nuclear power plant as

EBWR makes megawatts from neutrons

Written by R. N. Brey, in Charge, Nuclear Systems Group, for this advertisement.

• Earlier this year, nuclear power in the United States took its biggest forward stride to date with dedication and start-up of the Experimental Boiling Water Reactor, at the Argonne National Laboratory, near Chicago.

The EBWR is the first of the A.E.C.'s "five-year-plan" power reactors. Operation of the EBWR plant, and others yet to be built under the program, will constitute "road tests" of various reactor types. Power production will give authorities technical and economic data which will be decisive in planning the nation's nuclear future.

How It Operates

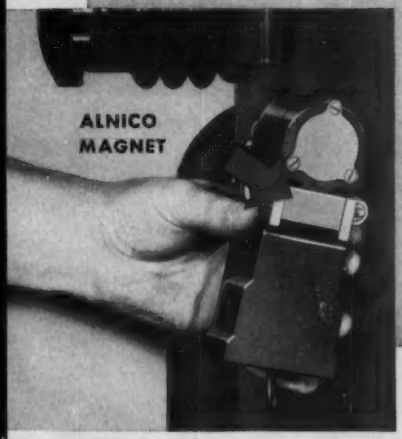
A boiling water reactor is so-named because the heat produced by the fissioning process in its fuel elements converts water to steam within the reactor vessel itself. This eliminates the heat exchange equipment common to other reactor types.

The steam collects in a dome above the water level, then goes through separators which remove carryover moisture. Water from the separators returns directly to the reactor vessel, while dry steam is piped to the turbine for generation of electrical energy. Steam passes from the turbine to the condenser, from which it is piped, as condensate, back to the reactor for reconversion to steam.

Complete Instrumentation

Ever since initial start-up of the EBWR, the generation of 5000 kw for the electric system of the Argonne Laboratory has been directed through an instrument system engineered and built by the

Continued on page 136



For mounting on transformers already in service, Alnico permanent magnet holds overload indicator on transformer tank. It will not creep or vibrate loose. The device provides an accurate yet economical overload indication.

New L-M Thermal Overload Indicator Easy To Install; Provides Constant Check

Simply attached and held by permanent magnet; provides continuous overload check; avoids service interruptions.

All you have to do is place the L-M thermal overload indicator against the transformer tank already in service, and it is installed. An Alnico permanent magnet holds the indicator firmly against the transformer tank. The indicator will not creep or vibrate loose. On new L-M Round-Wound® transformers the indicator is attached to a bracket permanently welded to the transformer tank.

This new device provides visible indication of overloads on conventional transformers up to 100 kva by means of a drop-down red light or drop-down luminescent tube. The luminescent type is provided with a nylon cord which can be attached to a cover bolt or other convenient projection to prevent the indicator from falling in the event the pole receives a severe shock.

Continuous Overload Check Without Interrupting Service

The L-M overload indicator provides an economical and reliable solution to load-study problems. It enables you to keep a continuous overload check on your distribution load and also eliminates the costly and laborious work required to take spot load checks.

In addition, the indicator on a conventional transformer does not interrupt service. It serves as a tool to reduce transformer burnouts and maintain service continuity by indicating serious overloads before they can cause trouble.

Compensates For Ambient Temperatures

The overload indicator measures tank-wall temperature (a function of top oil and hot spot temperatures), and makes proper allowance in transformer loading for variations in ambient temperature. Accuracy is sufficient for all practical purposes.

Indication Easily Seen

The overload indicator is available with a red light or reflecting tape. Both types are exceptionally brilliant and easily distinguished in daylight as well as at night. Indicator with red light requires an electrical connection to the transformer.

Indicating target is easily seen during the day or night. It is quickly and easily reset by simply pushing the indicating tube up.

Get Complete Information

L-M overload indicators are available for mounting on transformers in service, with permanent magnet, or stainless steel wire to wrap around tank. On new L-M Round-Wound transformers, indicator is attached to a bracket permanently welded to the transformer tank. Ask the L-M Field Engineer for bulletins and complete information. Or write Line Material Company, Protective Equipment Division, Milwaukee 1, Wis.

272-R3

LINE MATERIAL Protective Equipment
McGRAW-EDISON COMPANY

L-M's obround transformer is small, light, and has short moment arm distance from the pole. Total bending moment is greatly decreased and potential capacity of all your transformer structures is increased. Good regulation, high overload capacity and other Round-Wound characteristics have been fully maintained in L-M's obround design.

L-M's Obround Design Provides Less Bending Moment On The Pole

By D. A. MANNING
Assistant Product Manager
Transformers
Line Material Industries

L-M's exclusive obround transformer provides a smaller tank with less transformer oil, resulting in a light, easy-to-handle transformer. The obround design also brings the center of gravity of the transformer closer to the pole. The combination of light weight and short moment arm substantially reduces the total bending moment on the pole, and thus greatly increases the potential capacity of all your transformer structures. This advantage was accomplished without changing the outstanding performance characteristics of the Round-Wound® design.

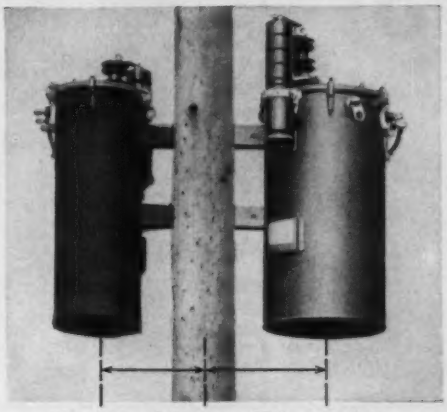
A comparison with four other major makes shows that the low bending moment of L-M's obround design is exceeded by as much as 50%. See the chart.

COMPARE Percent Bending Moment for All Five! See why more customers are selecting L-M obround transformers.

RATING	MANUFACTURER				
2400/4160 Y Voltage	Percent of L-M Bending Moment				
	LM	A	B	C	D
25 KVA	100%	110%	123%	133%	128%
50 KVA	100	123	113	142	120
100 KVA	100	123	115	137	132
167 KVA	100	105	093	115	091
7200/12470 Y Voltage	LM	A	B	C	D
25 KVA	100	131	124	149	126
50 KVA	100	123	110	150	119
100 KVA	100	119	122	149	125
167 KVA	100	107	087	112	089

In addition to reducing the bending moment for equivalent transformer ratings, you can now hang transformers of larger capacity on a pole structure and take advantage of savings such as these:

- Single-pole, three-phase transformer structures can now hold three 50 kva obround transformers instead of three 37½ kva round tank transformers. Thus you obtain 33⅓% more capacity and 15% less bending moment on the pole, and eliminate the need for a costly two-pole structure.
- Three 167 kva obround transformers can now be installed on a two-pole structure, obtaining 67% more capacity and less bending moment on the pole than with three 100 kva older-design transformers.



Comparison of these two 25 kva transformers shows how much closer the center of gravity of the obround design is to the pole than with the round design. The result is less bending moment on the pole.

Round-Wound Performance

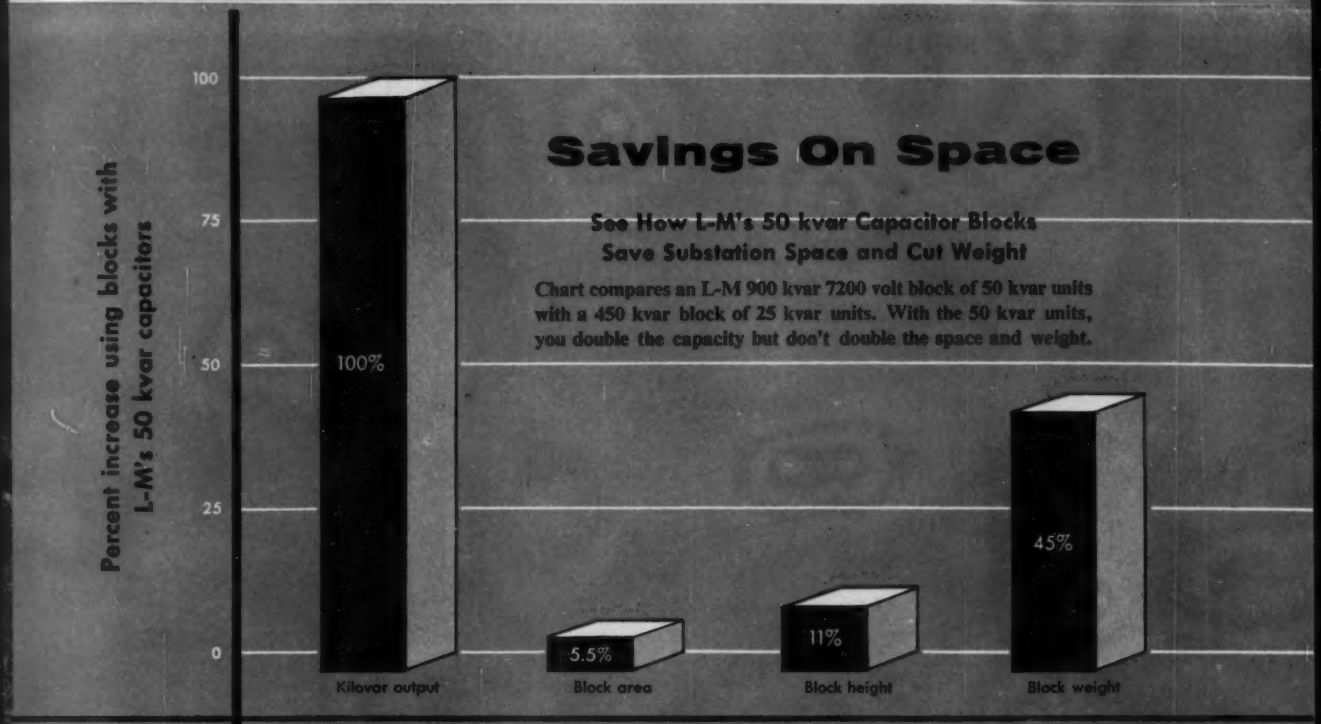
An outstanding fact to consider on the L-M obround transformer is that, unlike the extremely light transformers of some manufacturers, there has been no sacrifice of performance characteristics. The obround retains all the outstanding performance characteristics of L-M's Round-Wound core-coil design. These characteristics include low exciting current, low noise level, high impulse strength, high short-circuit strength, high short-time overload capacity and many others.

Get Details on L-M's Obround Transformer

Ask the L-M Field Engineer for application information, weights and dimensions on obround transformers and L-M's exclusive Round-Wound design. Or write Line Material Industries, Transformer Division, Zanesville, Ohio.

LM® LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Transformers

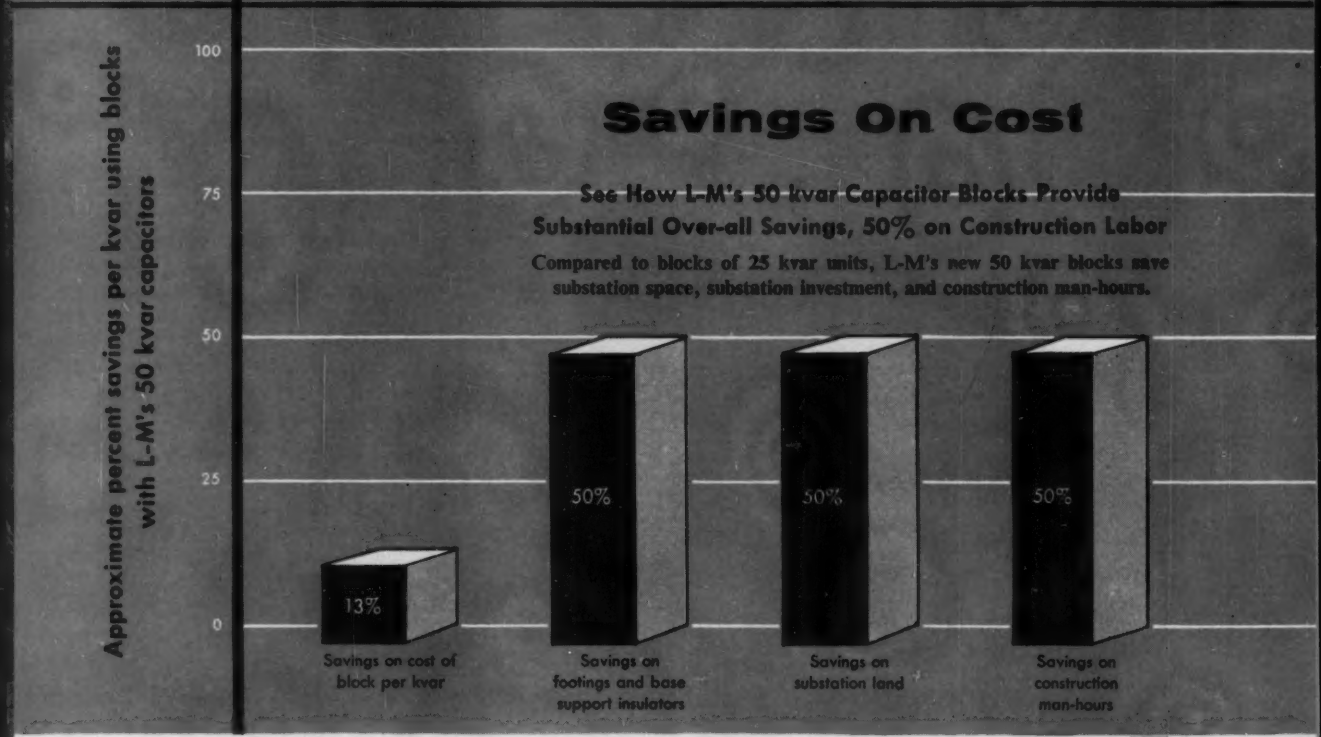
McGRAW EDISON



Savings On Space

See How L-M's 50 kvar Capacitor Blocks Save Substation Space and Cut Weight

Chart compares an L-M 900 kvar 7200 volt block of 50 kvar units with a 450 kvar block of 25 kvar units. With the 50 kvar units, you double the capacity but don't double the space and weight.



Savings On Cost

See How L-M's 50 kvar Capacitor Blocks Provide Substantial Over-all Savings, 50% on Construction Labor

Compared to blocks of 25 kvar units, L-M's new 50 kvar blocks save substation space, substation investment, and construction man-hours.

ANOTHER L-M CAPACITOR FIRST . . .

Units Now Shipped in New "Tear Strip" Carton

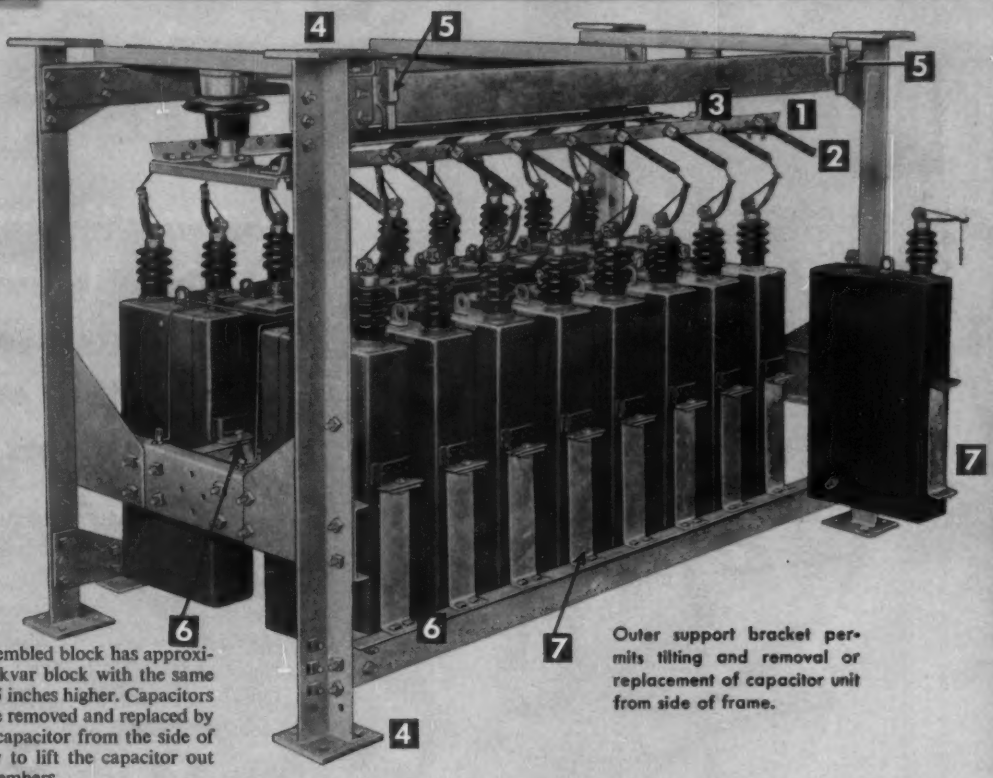
All individual L-M capacitor units are now packed in cartons that can be quickly and easily removed.

The new carton has a reinforced cloth tape cemented around the inside about two inches above the bottom. The tape is attached to pull tabs on the outside of the carton. When the tab is pulled, the tape makes a cut completely around the carton. The carton can then be quickly and easily lifted off the capacitor.

Simply pull the tape—to remove the carton.

296-R

1. Aluminum-alloy bus
2. Bus-mounted fuses
3. Bus connections wire brushed and treated with oxidation inhibitor.
4. Jig-assembled for perfect alignment of mounting pad bolt holes.
5. Lifting lugs.
6. Tapped holes in frame for capacitor mounting bolts. Nuts not needed.



L-M's new 50 kvar factory-assembled block has approximately the same area as a 25 kvar block with the same number of units and it is only 5 inches higher. Capacitors in L-M's 50 kvar blocks can be removed and replaced by simply tilting and sliding the capacitor from the side of the block. It is not necessary to lift the capacitor out from between the mounting members.

Outer support bracket permits tilting and removal or replacement of capacitor unit from side of frame.

Another L-M First...

L-M's 50 Kvar Capacitor Blocks Provide Kilovars At Still Lower Costs

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors and Regulators
Line Material Industries

Only half as many units are required in substation capacitor banks when you use L-M's new blocks of 50 kvar capacitors. In addition, these blocks reduce the number of fuses, footings, and base support insulators, as well as the construction man-hours required for any given-size bank. L-M 50 kvar preassembled capacitor blocks also cost less and require about 50% of the substation area per kvar in comparison with blocks containing 25 kvar capacitors.

Capacitor Unit

The internal construction of L-M's 50 kvar capacitor is identical with that of the 25 kvar unit except for the length of pack. There is no increase in voltage stress to get the higher kvar rating. The new design is the result of continued improvement in dielectric materials and manufacturing techniques.

The tank has the same width, same thickness as the 25 kvar capacitor. Only 10 inches of additional height give you twice the capacity. It also has aluminum-metallized coating under alkyd resin paint; paragroove clamp-type terminals; strong solder-sealed bushings; and low-temperature Elemex liquid dielectric.

Factory-Assembled Blocks

L-M offers a complete line of NEMA Standard 50 kvar factory-assembled blocks from 2400 through 7960 volts—400 to 1200 kvar ratings in 100 kvar increments.

Outstanding features of L-M factory-assembled blocks include:

- Aluminum-alloy bus which is not subject to cold flow.
- Bus-mounted capacitor fuses with stainless-steel flipper to eject the leader if fuse link ever blows. Leader cannot hit live parts.
- Connections to the bus are wire brushed, and treated with oxidation inhibitor.
- Height of block is increased only 5 inches, because it is so designed that capacitors can be installed and removed from the *side*. It is not necessary to provide clearance to lift the capacitor out from between the mounting members.
- Heavy galvanized frame is jig-assembled for perfect alignment of mounting-pad bolt holes.

Prompt Delivery Now

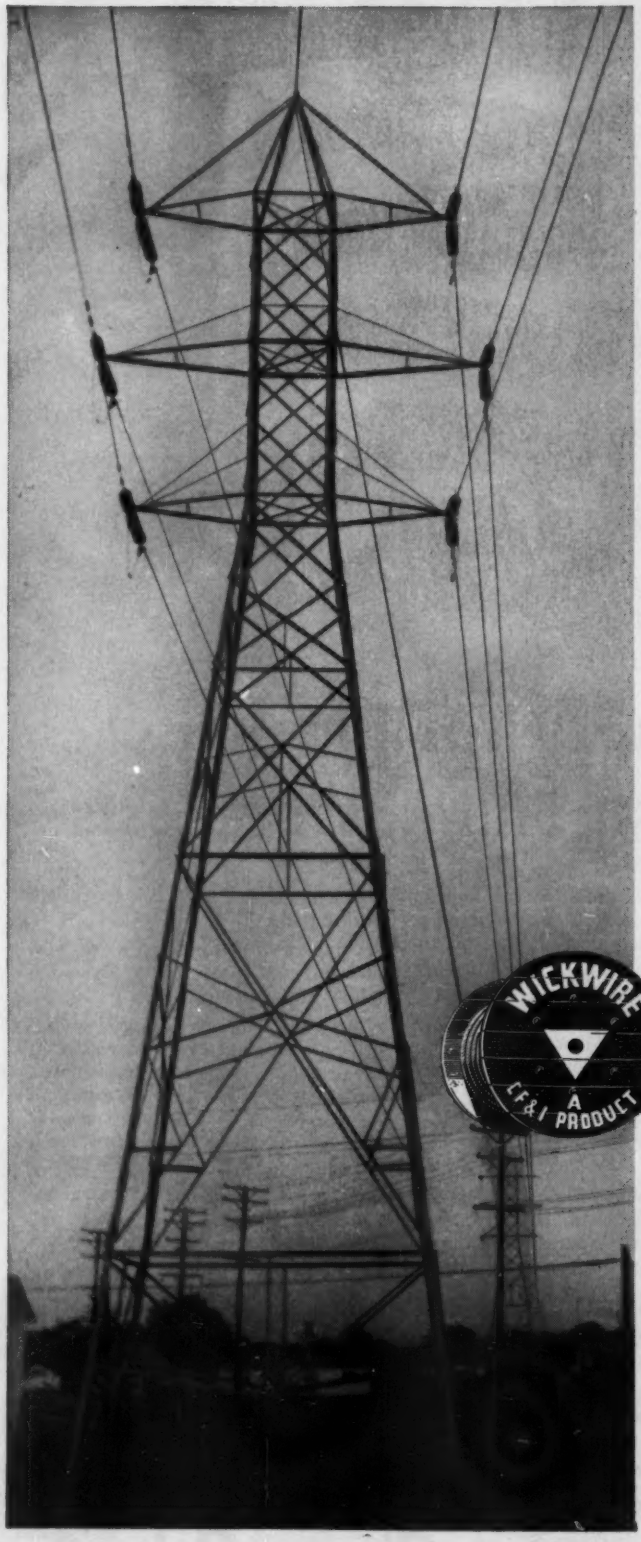
You can save on the cost of equipment, man-hours, and space in the substation when you specify L-M NEMA Standard 50 kvar capacitor equipments. Prompt delivery . . . on all sizes and voltage ratings. Ask your L-M Field Engineer for complete information on L-M's new 50 kvar factory-assembled capacitor equipments. Or write Line Material Industries, Milwaukee 1, Wisconsin.

McGRAW EDISON

296-AR2

LINE MATERIAL Industries *Elemex Capacitors*
McGRAW-EDISON COMPANY

CF&I GALVANIZED STEEL STRAND



for guy, messenger and overhead ground wire . . . quickly available from both eastern and western plants

No matter what part of America you're in, CF&I can quickly supply your needs for top-quality, guy, messenger and overhead ground wire. That's because three- and seven-wire CF&I Galvanized Steel Strand is made at both Buffalo, N. Y., and Pueblo, Colo.—a combination of plant sites that's ideal for speedy, nationwide distribution.

What's more, you can be sure of the quality of CF&I Galvanized Steel Strand because every phase of its production is supervised by the manufacturers of world-renowned Wickwire Wire Rope and Wire Rope Slings.

Next time you need strand—whether it's to your own specifications or to ASTM Specifications A-122 or A-363—be sure you explore the many advantages offered by CF&I Galvanized Steel Strand. Better still, contact your nearby CF&I representative today.

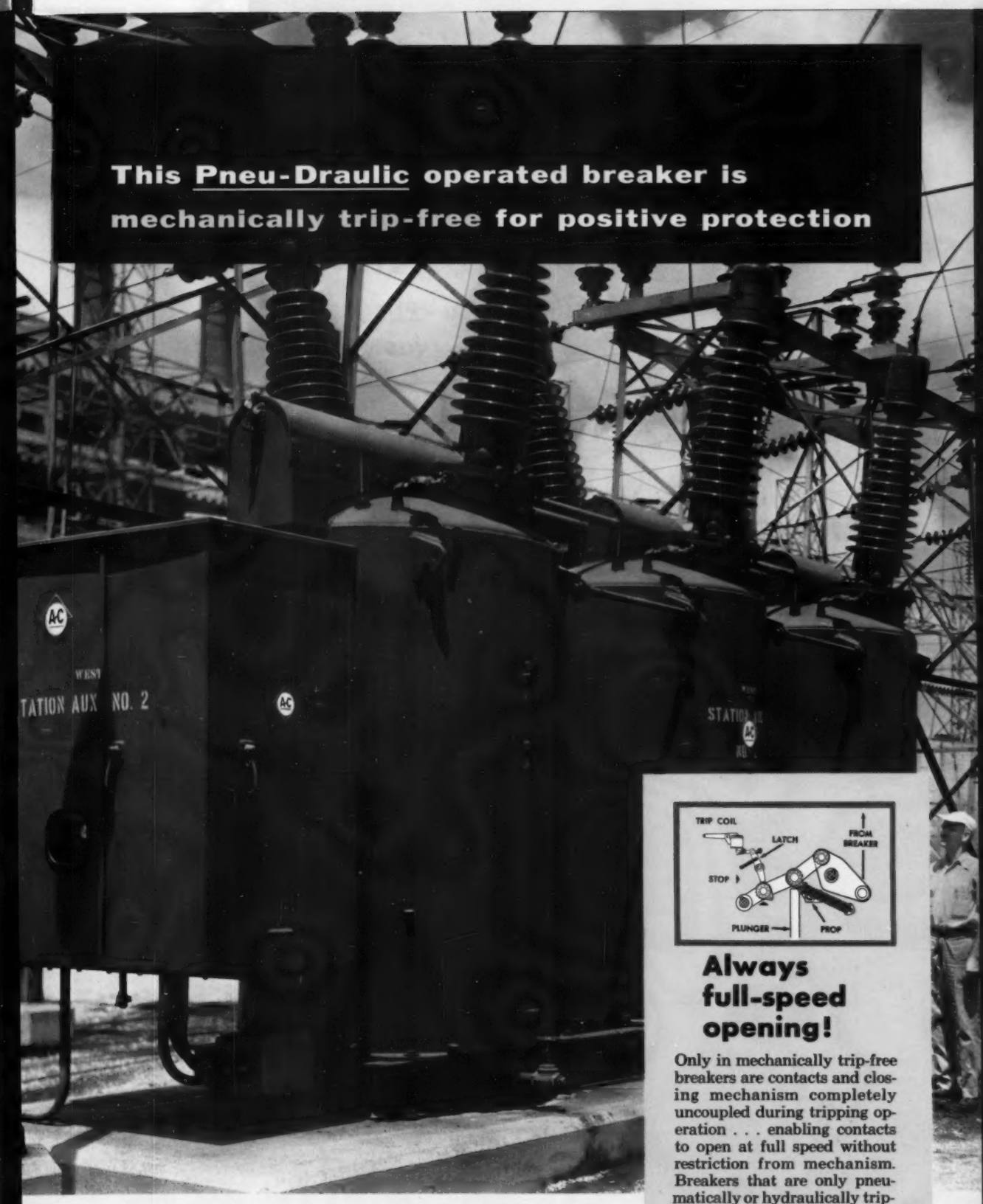
GALVANIZED STEEL STRAND

THE COLORADO FUEL AND IRON CORPORATION

Albuquerque • Amarillo • Atlanta • Billings • Boise
Boston • Buffalo • Butte • Chicago • Denver • Detroit
El Paso • Ft. Worth • Houston • Kansas City • Lincoln (Neb.) • Los Angeles • New Orleans • New York
Oakland • Oklahoma City • Philadelphia • Phoenix
Portland • Pueblo • Salt Lake City • San Francisco
Seattle • Spokane • Wichita

CF&I OFFICES IN CANADA: Montreal • Toronto

4262



Always full-speed opening!

Only in mechanically trip-free breakers are contacts and closing mechanism completely uncoupled during tripping operation . . . enabling contacts to open at full speed without restriction from mechanism. Breakers that are only pneumatically or hydraulically trip-free cannot give you this protection.

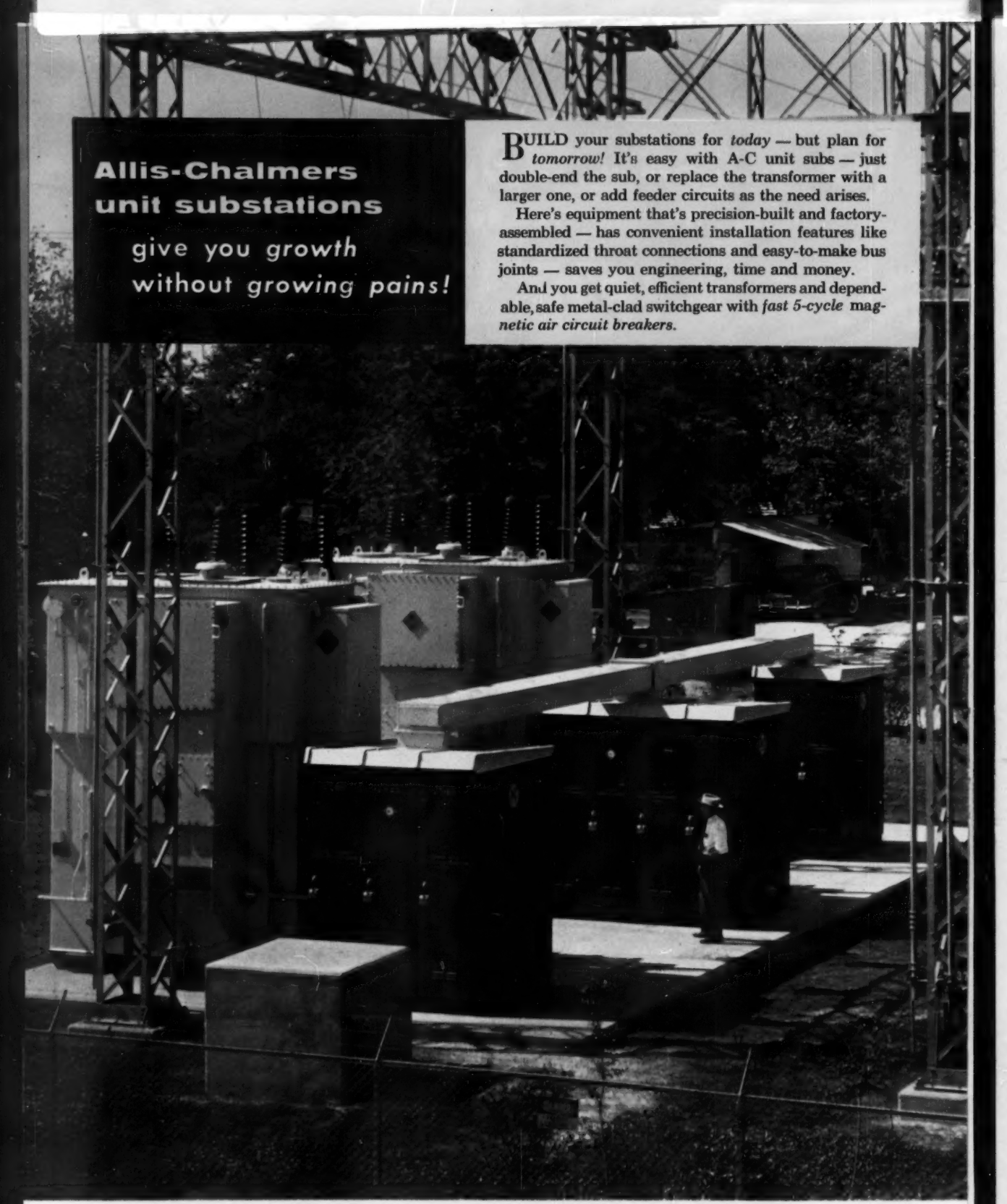
Pneu-Draulic is an Allis-Chalmers trademark.

Get details on this and other features of Allis-Chalmers breakers. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-5238



BUILD your substations for *today* — but plan for *tomorrow!* It's easy with A-C unit subs — just double-end the sub, or replace the transformer with a larger one, or add feeder circuits as the need arises.

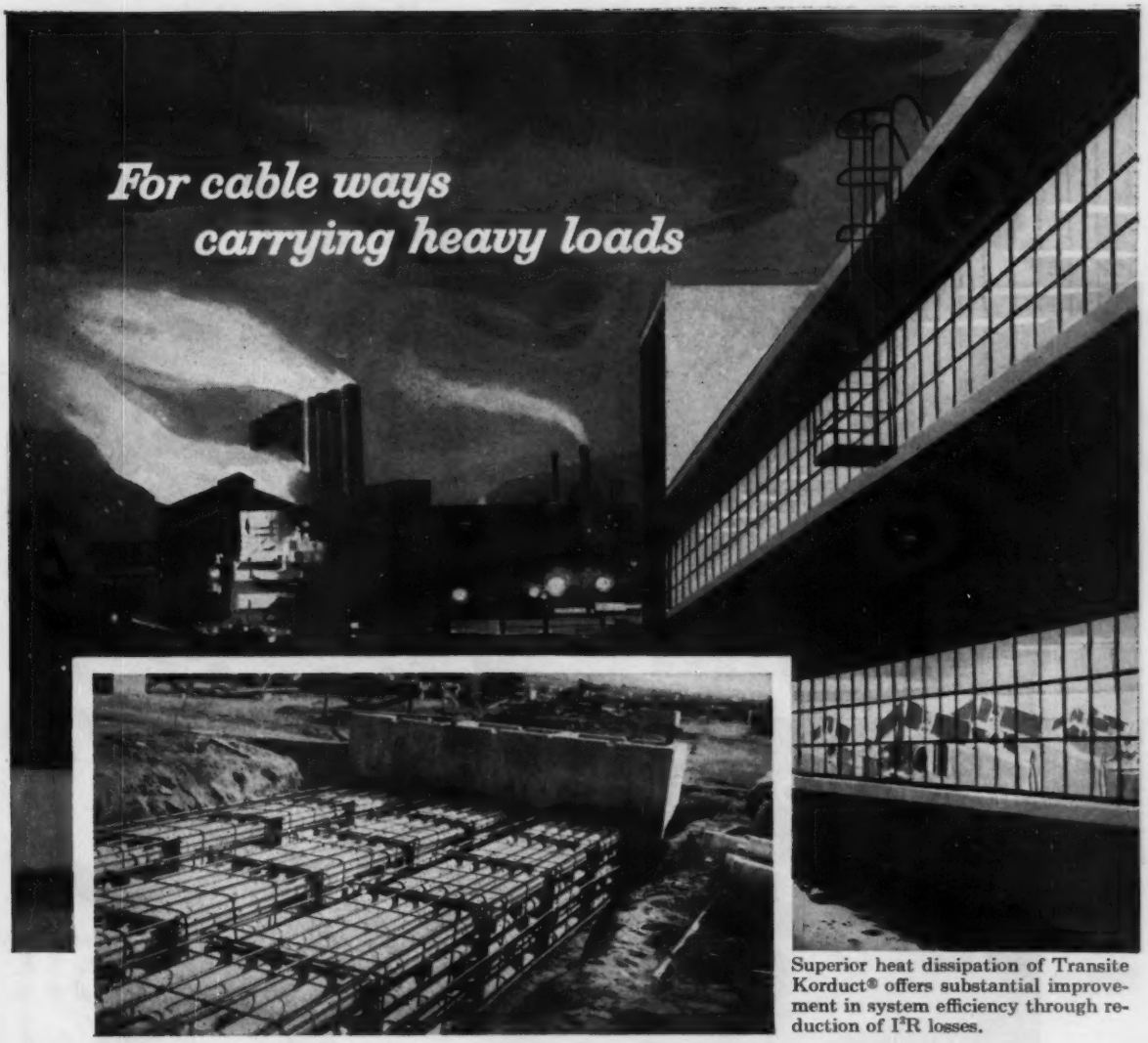
Here's equipment that's precision-built and factory-assembled — has convenient installation features like standardized throat connections and easy-to-make bus joints — saves you engineering, time and money.

And you get quiet, efficient transformers and dependable, safe metal-clad switchgear with *fast 5-cycle magnetic air circuit breakers.*

A-5245

For details regarding A-C unit substations, contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS *for progress in switchgear*



Superior heat dissipation of Transite Korduct® offers substantial improvement in system efficiency through reduction of I^2R losses.

J-M Transite® Ducts mean increased capacity—longer cable life—maximum return on investment

FINDINGS OF TESTS made at Johns-Manville Research Center and approved for presentation by AIEE Insulated Conductor Committee, show that J-M Transite Ducts dissipate heat of cables faster. The result is cooler cables under a given load . . . lower I^2R losses . . . longer insulation life from lower operating temperatures.

Transite Ducts offer many other advantages, too. Made of asbestos-cement, they are incombustible, resistant to corrosion, unaffected by electrolysis. Transite Ducts resist damage when arcing occurs. These durable, lightweight ducts provide complete and permanent cable protection, together with savings on installation and maintenance.

For complete details of tests and the many advantages of Transite Ducts, write for Brochure EL-29A, and J-M Cooler Cables story. Johns-Manville, Box 14, N. Y. 16, N. Y. In Canada: Port Credit, Ont.

Johns-Manville TRANSITE Asbestos-Cement DUCTS

J-M CONDUIT for direct buried banks and exposed runs—J-M KORDUCT® for concrete banks

Nicopress Sleeves and Tools Patented in U.S. and Foreign Countries. "Nicopress" Registered in U.S. and Foreign Countries.

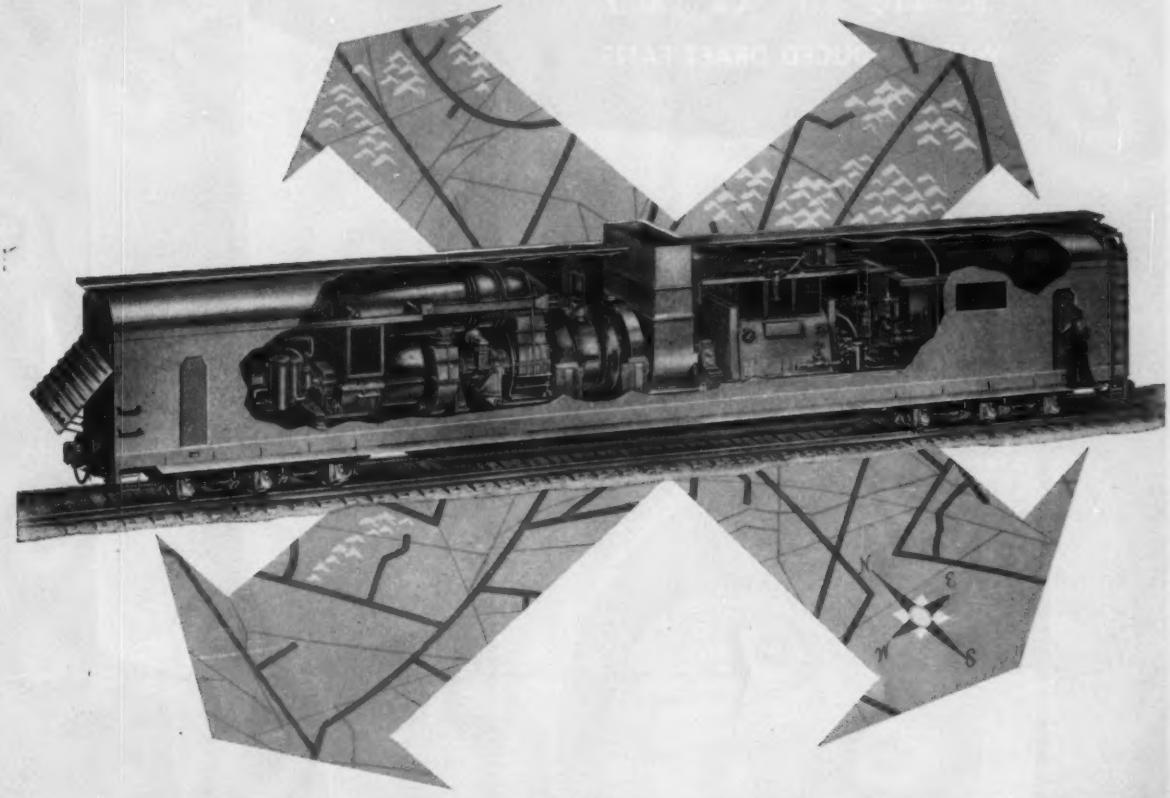
The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

KILOWATTS



...where and when you need them

Heavy temporary electrical loads out at the end of the line present a serious problem to most electrical utilities particularly when the industry served is an important one.

There is, however, a practical answer to peak loads or emergency needs . . . the Clark Turbo-Mobile Power Plant. This gas-turbine-driven unit is a completely self-contained, rail car mounted, generating station. Burning liquid or gaseous fuels, it can generate up to 6,750 KW, measured at the generator terminals, anywhere that there are railroad tracks. And whether the "temporary" demand lasts for a day or a year doesn't matter. The Clark unit is designed for continuous 24 hour a day service for as long as required.

Stationary gas-turbine-driven generating units can also be provided. When equipped with a regenerator, a thermal efficiency of 29% is achieved at a KW output of 6,200. When used in a combined cycle, with the exhaust gases generating steam in a waste heat boiler, up to 10,000 KW can be generated at a thermal efficiency of 29%. Both efficiencies are based upon the fuel's low heat value.

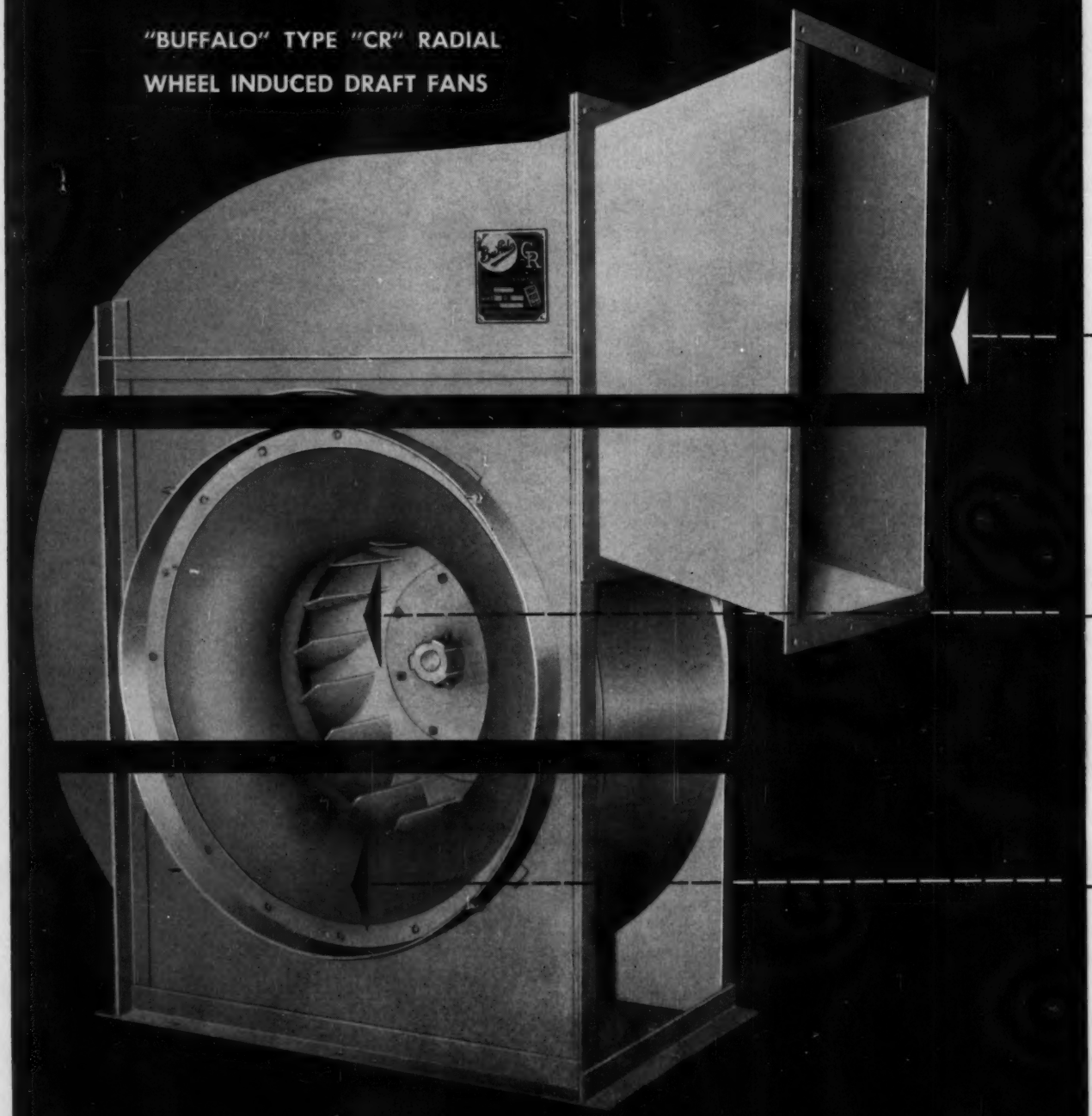
Clark engineers are available to analyze your specific applications with regard to portable or stationary gas-turbine-driven generating equipment. Consult your nearest Clark representative.

CLARK BROS. CO., OLEAN, NEW YORK
One of the Dresser Industries
Offices in Principal Cities Throughout the World

CLARK® DI

Portable Generating Equipment

"BUFFALO" TYPE "CR" RADIAL WHEEL INDUCED DRAFT FANS



Radial Wheel Fans are just one of a complete series of "Buffalo" Draft Fans covering the full range of varying boiler requirements. Whether you are interested in extremely high efficiency — fan size or first cost, "Buffalo" can offer you the best selection — with no compromise. Contact the "Buffalo" Engineering Representative nearest you, or write us about your requirements today!

ARE THESE THE FAN CHARACTERISTICS TO MEET YOUR INDUCED DRAFT REQUIREMENTS?

● **DIVERGENT OUTLET IMPROVES STATIC CONVERSION** — Providing a gradual change from velocity at the fan cutoff to static pressure in the duct, this unique "Buffalo" feature eliminates a common source of turbulence in fans. From inlet to outlet, such complete streamlining has produced a new high in efficiency. At the same time, it has minimized abrasive effects in every part of the fan.

● **3 WHEELS TO CHOOSE FROM** for varying characteristics within the "Buffalo" Radial blade type of fan. Besides the type "CR", two other types may be selected for different volume and pressure characteristics. Note the deeply pressed curved flange for smooth air flow and rigidity. The blades are radial at the tip, curving smoothly forward at the inlet.

● **SMOOTH CURVED INLET PATH** formed by inlet bell and matching wheel flange minimizes both turbulence and abrasive effect. The "CR" is the only fan of its kind designed for either open inlet or variable inlet vanes — and is therefore an excellent choice for inlet volume control. "Buffalo" cantilevered inlet vanes do not reduce the high performance of this fan.

● **HIGH VOLUME, HIGH PRESSURE** — This characteristic of the "Buffalo" Type "CR" Fan not only makes it desirable for many induced draft applications — but often makes possible selection of a smaller size on certain direct drive installations, for lower first cost.

● **RESISTANCE TO ABRASION** — This has made the "CR" popular on coal-fired boilers and other abrasive jobs. Available with wearing strips for the most severe conditions, though complete streamlining makes it inherently resistant to abrasion.

● **OVER 78% MECHANICAL EFFICIENCY OVER A WIDE RANGE** — a very favorable balance of performance with low first cost and low operating cost. (Where efficiency is the principal consideration, your choice might be a "Buffalo" Airfoil or Backward Curve Fan.)

● **LONG LIFE UNDER SEVERE SERVICE** — In addition to inherent resistance to abrasion, the "CR" has the typically heavy-duty, rigid construction of all "Buffalo" Draft Fans — heavy plate housing and blades, oversize shafts and bearings.

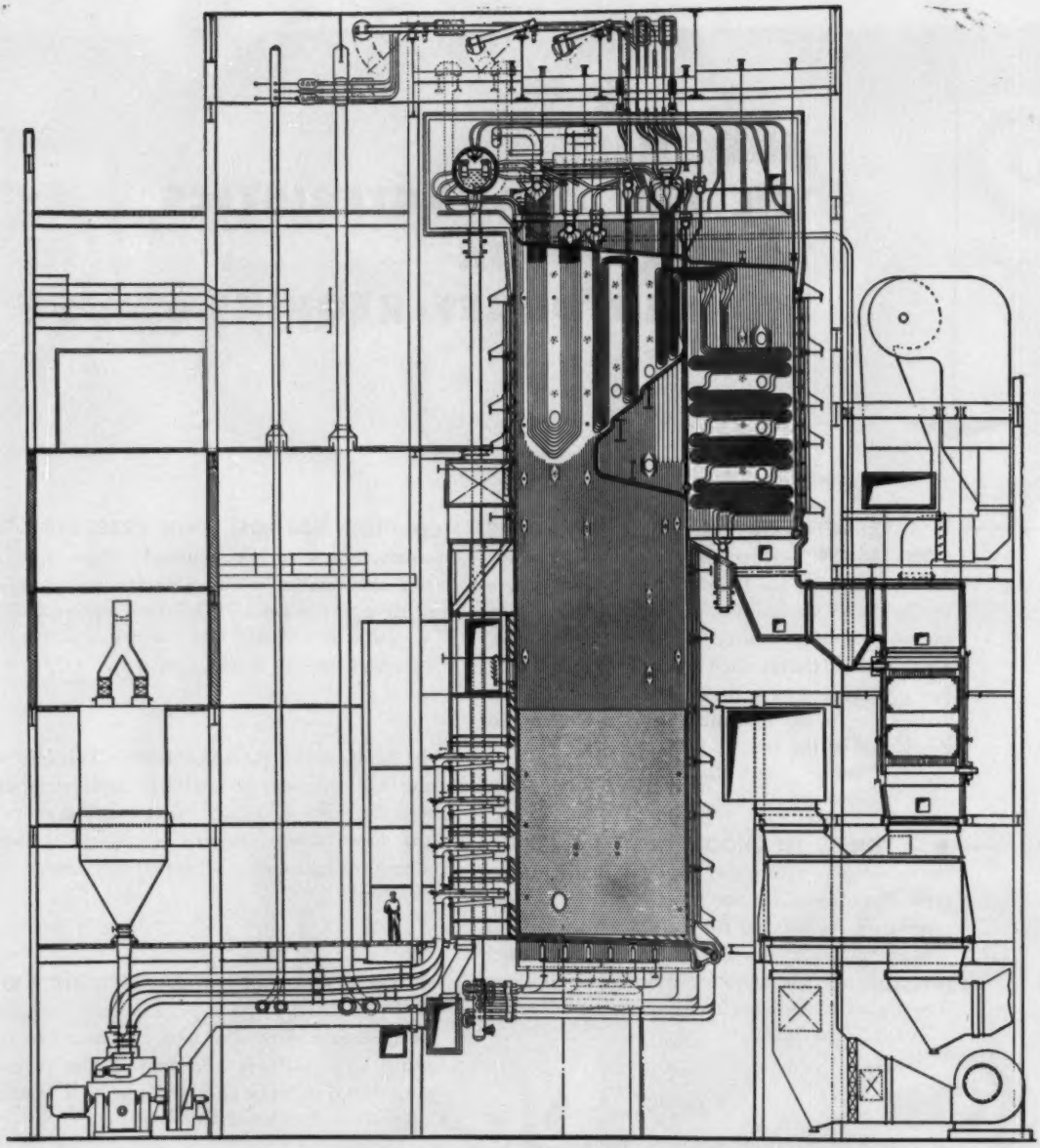
**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life in every "Buffalo" product.*

BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING



Latest unit for Burlington Station, Public Service Electric & Gas Company has a capacity of 1,350,000 lb of steam per hr. Comprehensive circulation tests on this unit, plus more than a year of sustained performance, proved that natural circulation boilers can operate easily with drum design pressures of 2800 psi, for throttle conditions over 2400 psi.

B&W NATURAL CIRCULATION BOILERS ABOVE 2600 PSI DESIGN PRESSURE

NAME OF UTILITY	STATION	NO. UNITS	DES. PRESS. psi	THROTTLE PRESS. psi	TOTAL TEMP. F	REHEAT TEMP. F	TOTAL KW
Indiana & Michigan Electric Co.	Twin Branch	1	2650	2335	940	900	76,500
Public Service Electric & Gas Co.	Burlington	1	2700	2350	1100	1050	200,000
Public Service Electric & Gas Co.	Linden	1	2700	2350	1100	1050	225,000
Southern California Edison Co.	Huntington Beach	2	2700	2400	1050	1000	400,000
Virginia Electric & Power Co.	Bremo	1	2700	2400	1000	1000	150,000
International General Electric Company	Chiba	1	2700	2400	1060	1010	175,000
Memphis Light, Gas & Water Div.	Thos. H. Allen	3	2825	2400	1053	1053	862,500
Detroit Edison Co.	St. Clair	1	2700	2400	1050	1000	325,000
Virginia Electric & Power Co.	Portsmouth	1	2700	2400	1000	1000	150,000
Southern California Edison Co.	Mandalay	2	2700	2400	1050	1000	400,000
Pacific Gas & Electric Co.	Pittsburg	2	2725	2400	1050	1000	660,000
TOTAL CAPACITY SERVED							3,624,000

If You Are Considering...

2400 PSI THROTTLE CONDITIONS

You'll Want to Investigate B&W's Unique Experience

There's a reason why so many progressive utility companies and their engineers, thinking of turbine throttle conditions of 2400 psi, have turned to B&W. It is the unique record of performance of B&W high pressure natural circulation boilers.

Simplicity of installation and operation has been brought to high pressure steam generation by B&W natural circulation boilers. They have lower operating costs because no machinery requiring power and maintenance is needed for circulation.

Long range operating experience—since 1939—has been gained with natural circulation high pressure boilers operating above 2000 psi. Operators' success with natural circulation boilers is due to the B&W Cyclone Steam Separator, and a design which makes liberal use of outside downcomer capacity and provides proper balance of makeup and riser tubes.

Clean turbines are an extra plus value. Cyclone Steam Separators not only maintain good circulation, but, used with Steam Washers, they maintain exceptionally clean turbines. At one plant, where a B&W Radiant Boiler has been on the line constantly for a year, the turbine manufacturer reports that the turbine is the cleanest high pressure unit his engineers have ever seen. And tubes in the high duty part of the furnace are as clean internally as the day they were installed.

B&W first designed natural circulation boilers for operation at drum pressures over 2000 psi nearly 20 years ago. Today 86 B&W natural circulation boilers with these high design pressures are in operation and 52 more are being built.

The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

G-845-C3

BABCOCK & WILCOX

BOILER DIVISION

Another new development using

B.F.Goodrich Chemical *raw materials*

Installation of Triplex wire manufactured by Southwire Company, Carrollton, Georgia.

Here's a rugged outdoor performer... TRIPLEX *insulated with* GEON

IT'S TOUGH, weatherproof, and maintains its exceptional electrical properties with age—that's why insulation of Geon polyvinyl materials is offered on Triplex line wire and service drops.

This wiring takes pulling over crossarms, dragging along the ground and the other punishment that goes along with outdoor wire installation. The physical properties and aging characteristics exceed all accepted standards for this application.

The insulation of Geon polyvinyl materials shuns the sun, oxygen and ozone attack. In industrial areas, it withstands oils, greases and the effects of air-borne acids, alkalis and other chemicals. What's more, it resists flame, will not support combustion and has good flexing properties. The wire is light, small in diameter, free stripping, easy to handle and competitively priced.

For the greatest lifetime economy, choose wiring with this exceptional covering. For more information, write Dept. GE-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
a division of The B. F. Goodrich Company

B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Your Westinghouse representative can prove...

6 MAJOR TRANSFORMER IDENTIFICATION IMPROVEMENTS

Simplify selection, maintenance, inventory, load monitoring. New serial and style numbers on larger nameplate give complete transformer description instantly. Protective link and LV lead identification, new kva Vinyl-Cal and offset breaker handle identify 20% greater overload capacity . . . all measurable in operating dollars saved.

J-70795

YOU CAN BE SURE... IF IT'S

Westinghouse

F. T. Hausle, Distribution Design Engineer of Long Island Lighting Company, one of the three utilities who did experimental engineering and field load testing of both old and new Type CSP® transformers, agrees with Tom Oliver, Westinghouse representative, that "positive identification has always been significant in resolving operating, purchasing and engineering problems of transformer use."

New power and economy

One of 9 reasons why you'll find International Trucks cost least to own!

New, redesigned engines in all Golden Anniversary INTERNATIONAL Trucks produce more usable horsepower—power without strain—to make operating and maintenance costs lower.

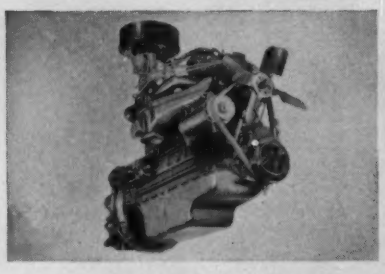
You get faster acceleration, flashing performance along with famous INTERNATIONAL dependability and economy. Choice of nine engines, including the most powerful "six" in its class. Easier starting and greater efficiency are yours, plus superior underhood accessibility.

Consider *ownership* costs. When you do, your choice will be an INTERNATIONAL because INTERNATIONAL Trucks cost *least* to own over the years. Cost records prove* this. Your INTERNATIONAL Dealer can prove it with the right model for you. See him today.

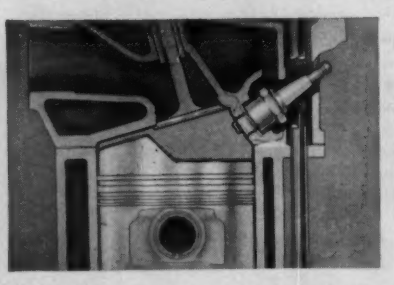
**Signed statements in our files, from fleet operators throughout the U.S., back up this statement.*

INTERNATIONAL HARVESTER COMPANY, CHICAGO

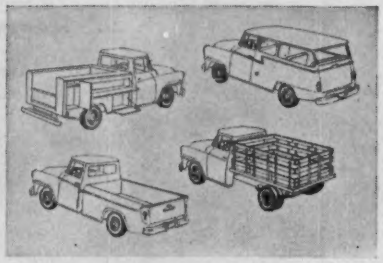
Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors



1 New, more usable power in every model. All nine 6-cylinder engines have greater horsepower and torque to match the truck, load and hauling conditions. All are *truck-built* for lowest cost operation and long lasting dependability.

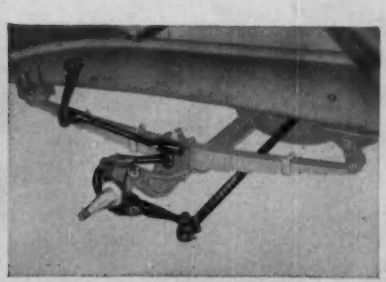


2 Greater operating economy and efficiency. Higher compression ratios, new combustion chamber design, improved valves, ports and pistons reduce operating and upkeep expense. Easy-starting 12-volt ignition system with "hot spark" circuit.

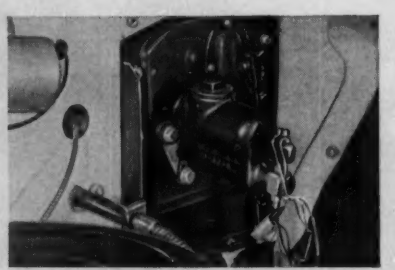


3 Twenty factory-built bodies—three pickups, 7 service-utilities, 1 panel, 1 Travelall®, 4 stakes and 4 platforms—132 combinations of bodies and models. Small or large loads, INTERNATIONAL meets all your requirements *exactly*.

4 Widest seats, biggest windshields in their field. Quietest wing vents in any car or truck. Exclusive 5-point cab mountings for quiet, level ride and longer cab life. Four-spoke safety steering wheel. Choice of 37 color combinations.

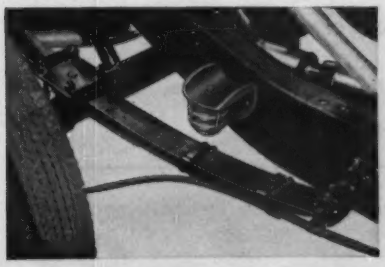


5 True geometric steering for safer, easier handling and short turning circles. Steering gears are mounted *ahead* of the front axle. Steering wheel is located in a natural, comfortable position. Power steering available on all models.



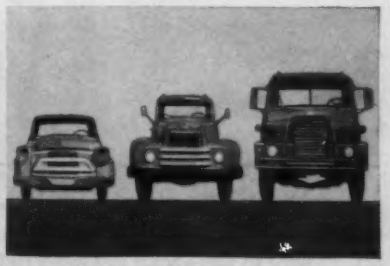
6 Safer, easier braking and longer lining life. New easy-to-service under the hood master cylinder and suspended pedal require less foot pressure. Many models have larger boosters, bigger wheel cylinders or increased lining area.

New Golden Anniversary INTERNATIONAL Trucks range from 4,200 to 22,000 lbs. GVW... 22 models with 132 body-model combinations. Powered by nine new, redesigned engines, gasoline and LPG, with up to 154 hp. Every component of every model built to save operating and upkeep costs . . . built to cost *least* to own over the years.



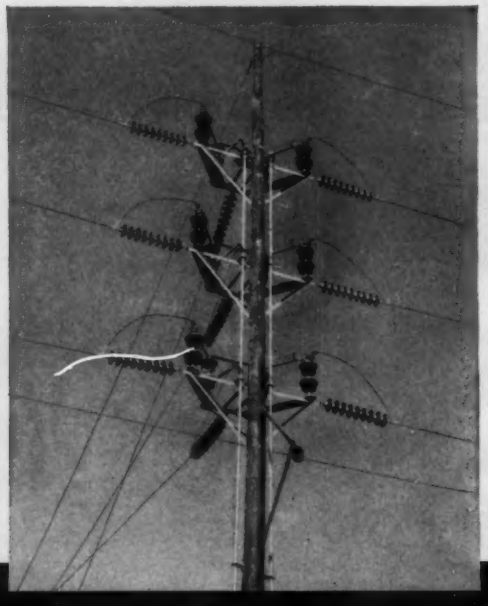
7 Smoother riding. Wide leaf springs increase stability, reduce chassis height and friction for smoother riding and longer spring life. Light-duty models have exclusive rubber blocks available as auxiliary springs to cut wear and maintenance.

8 All-wheel-drive INTERNATIONALS have the extra traction and pull needed for all off-road operations . . . all the comfort for highway hauling. Completely factory-built with low height and ample ground clearance. Complete selection of equipment.

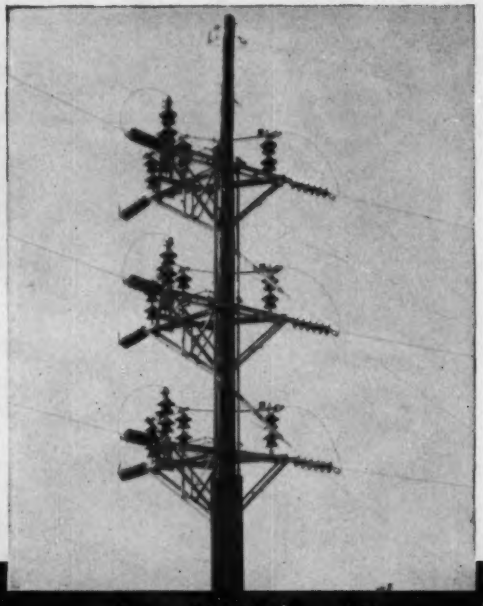


9 World's most complete line. There is an INTERNATIONAL "tailor-made" for every job, half-tonners to 96,000 pounders. Choice of 4-wheel, 6-wheel and all-wheel-drive models, conventional and COE design. Every one built to cost *least* to own.

Save Costs with POLE TOP SWITCHING



Type ALT-2 Two-Way
Line Tap-off Switching



Type ALT-3 Three-Way
Loop or Sectionalizing Switching

R&IE ALTO LINE TAP-OFF SWITCHES . . .

provide <u>new</u> operating advantages with the Arc Restrictor

Here's how you save costs on . . .

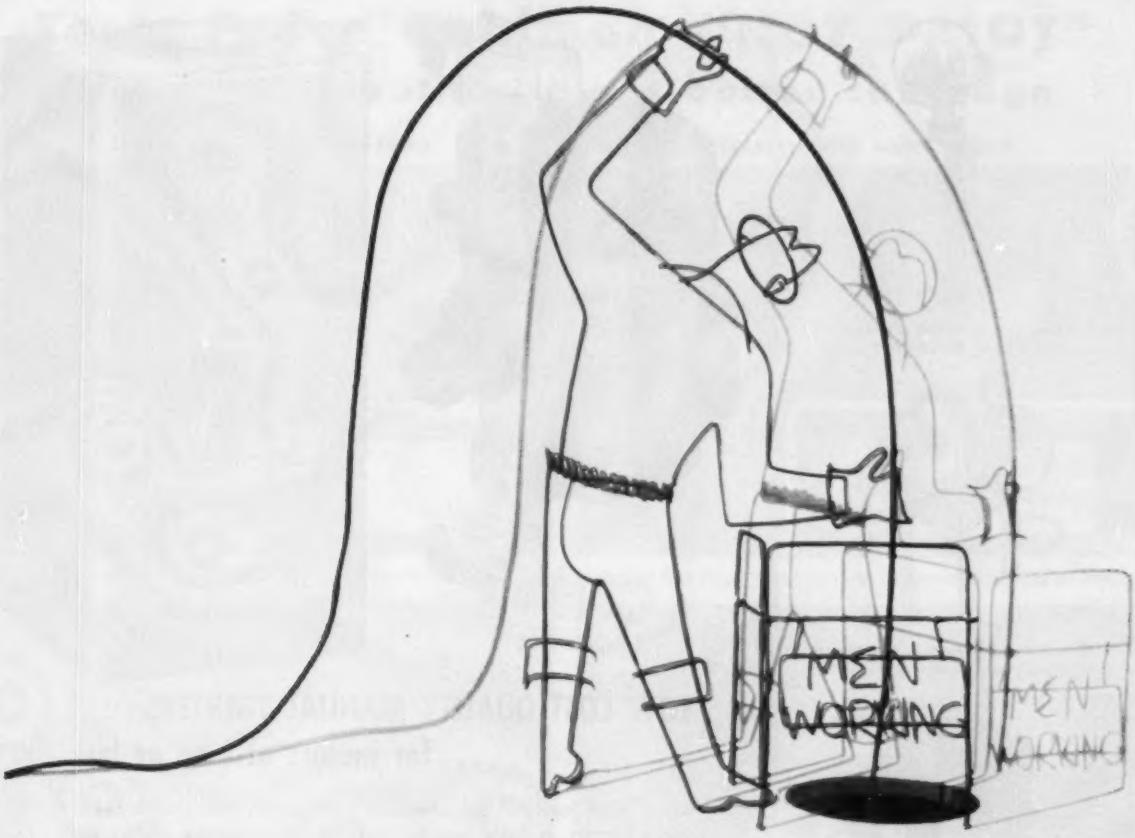
- **CONSTRUCTION**—one wood pole required instead of two or four. Mileage is increased between switch locations when interrupting line charging current.
- **INSTALLATION**—a single rack for group of switches, requiring a minimum of installation time and effort.
- **MAINTENANCE**—only one assembly to inspect and service.
- **RIGHT OF WAY**—less property to occupy.

• ALTO Two-Way and Three-Way Switching not only cuts costs of installation and maintenance, but provides a safe way to solve your growing switching problems. The R&IE Arc Restrictor quick-break horns snap the arc before it can start.

• Start planning now for more economical line switching . . . write for ALTO Bulletin 1346B . . . ask to see the motion picture test films which demonstrate the performance of the ARC RESTRICTOR.

• • •

R & IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER COMPANY
GREENSBURG, PA.



Wire sculpture by Henry Szafarz

The Inside Story

Beneath the surface, there's a lot going on.
An underground river of power surges through innumerable cables, supplying the electrical energy that keeps the entire community rolling smoothly.

Throughout the nation, Simplex products are used extensively in such applications. This is particularly true of ANHYDREX XX, the ideal all-purpose cable for high-voltage use. This expertly engineered cable is popularly employed in the 2001 to 35,000 volt range, and has a Conductor Temperature Rating of 90°C up to 5 KV (a rating never attained before the development of ANHYDREX XX).

For more technical data, write for Booklet 1023.

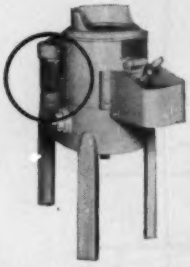
SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Simplex Anhydrex XX Underground Cable

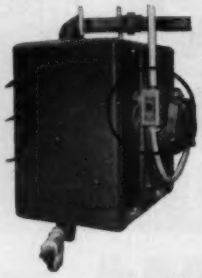
Simplex

LIVE BETTER ELECTRICALLY

Townsend impact riveter protected by an Allen-Bradley Bulletin 600 starter.

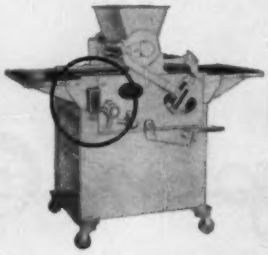


Gifford-Wood vegetable peeler with an Allen-Bradley Bulletin 600 starter.

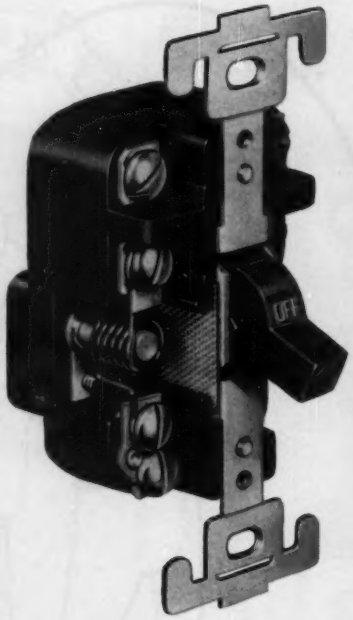


Unit space heater protected by an Allen-Bradley Bulletin 600 starter.

Kleen-Kut meat mixer has a ¾ hp motor and an A-B Bulletin 600 starter.



Triumph cookie dropper is protected by an Allen-Bradley Bulletin 600 starter.



LOW COST QUALITY MANUAL STARTERS
....for motors of 1 hp or less

Many small machine tools, restaurant equipment, fans and blowers, space heaters, etc., are operated by fractional horsepower motors. But even though the motors are small and relatively inexpensive, a motor burnout may disrupt important production schedules and, therefore, prove to be a costly accident.

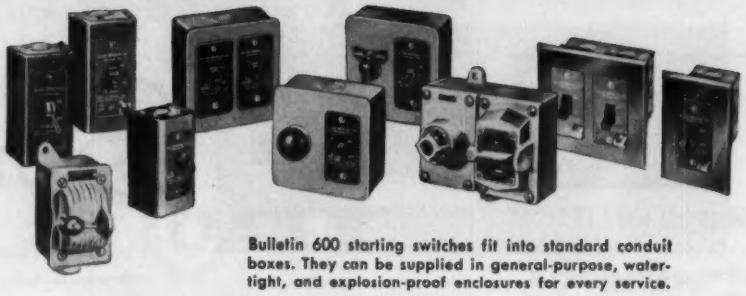
Play safe—equip all of your small motor drives with Allen-Bradley Bulletin 600 starters. They have a built-in solder pot thermal overload breaker which remains accurate and dependable. It is low cost safety and production insurance.

Write for Bulletin 600, please.

Allen-Bradley Co.
1327 S. First Street
Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ontario

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

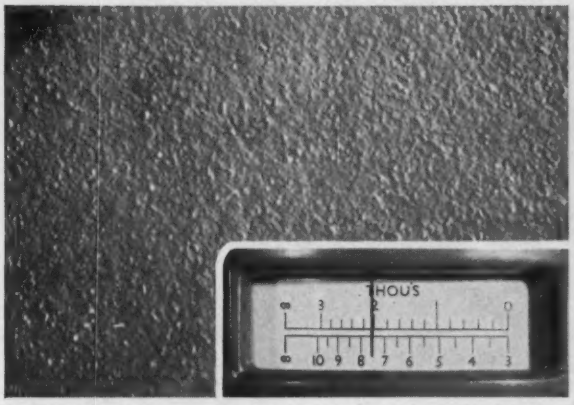


Bulletin 600 starting switches fit into standard conduit boxes. They can be supplied in general-purpose, watertight, and explosion-proof enclosures for every service.

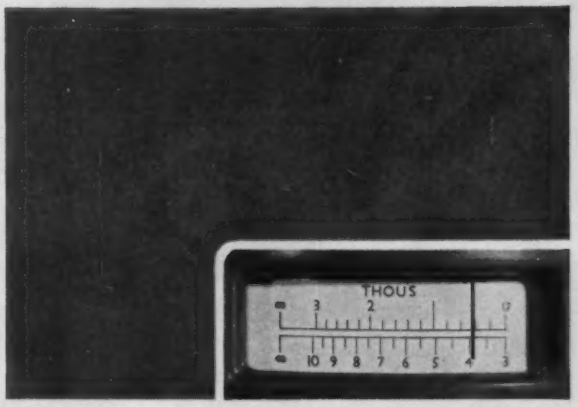
Tests Prove Kuhlman "HOT PAINT"

flows on smoother, gives better coverage

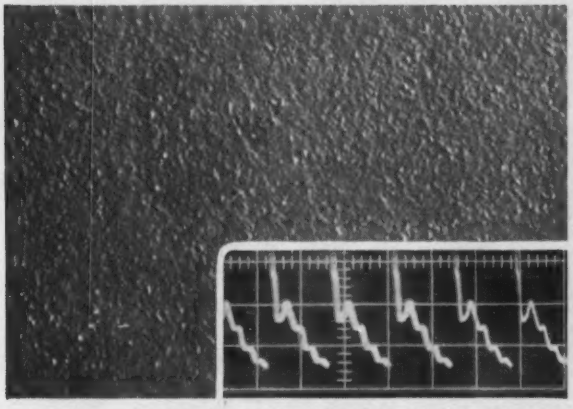
ORDINARY TRANSFORMER FINISH

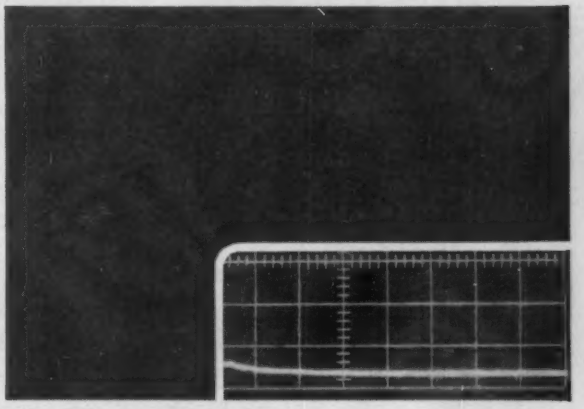


KUHLMAN "HOT PAINT" FINISH



The above mil guage readings measuring paint thickness, prove that the film thickness of the Kuhlman "Hot Paint" finish is approximately 50% greater.





This is a porosity detector test. Any minute pin-holes in the transformer paint allows the detector to make electrical contact with the transformer tank metal. A signal results (shown on the oscilloscope screen at the left) indicating a porous surface. No signal (Kuhlman "Hot Paint" finish) indicates a non-porous surface.

KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman representative, and are the first one to notify Dept. SA-I, Kuhlman Electric Company, P.O. Box 288, Birmingham, Michigan, you will receive a valuable gift.

Here's the reason why:

Kuhlman distribution transformer finish is uniformly heated before it is applied.

This "HOT PAINT" requires less solvent for a given viscosity and allows more *weather-resistant* paint solids to be deposited on the tank surface. As a result Kuhlman "Hot Paint" covers more evenly—without running, thinning out, or orange peeling. It produces a heavier filmed, non-porous finish that will last longer and cut repainting costs.

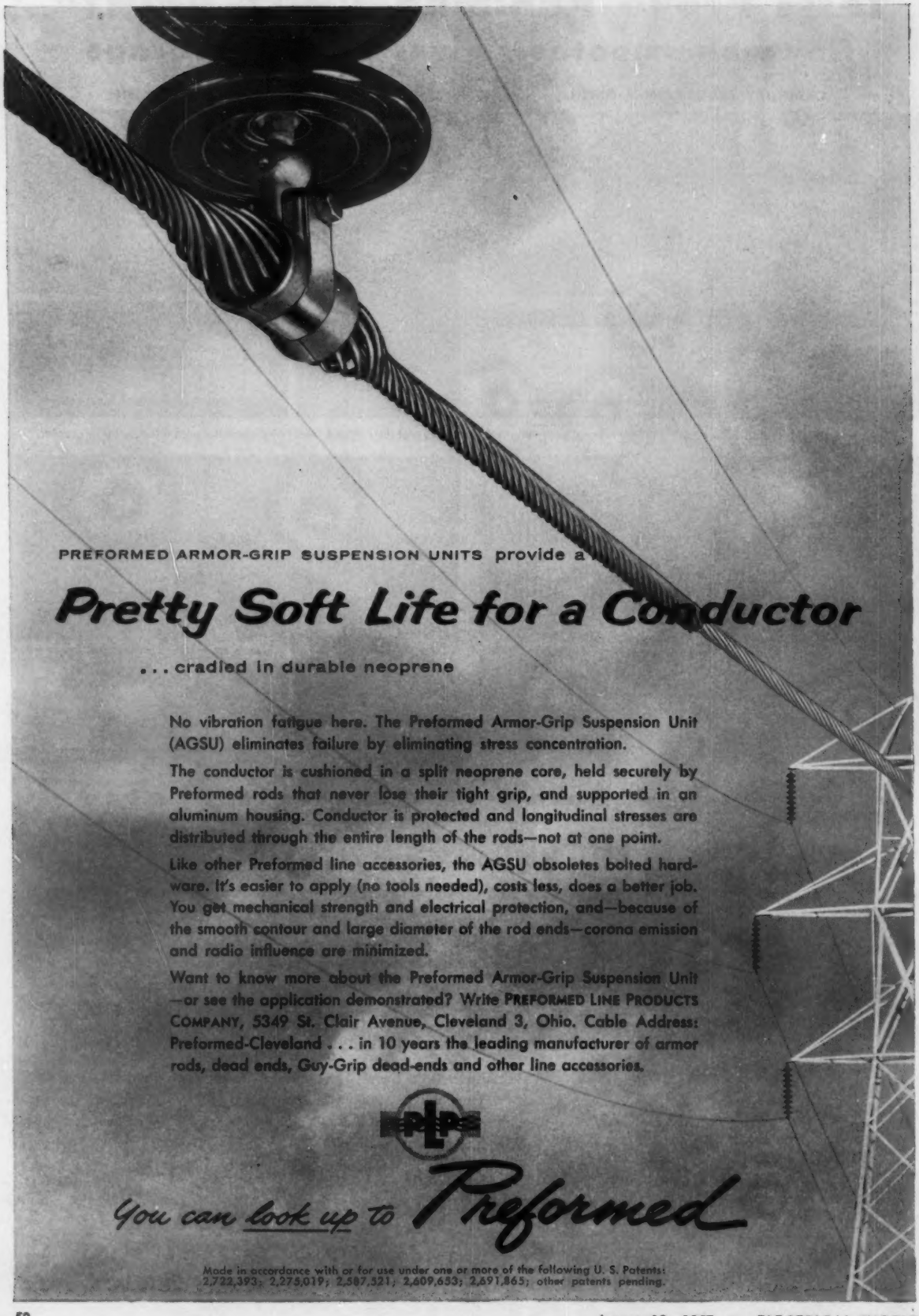
The above tests prove "Hot Paint's" exceptional quality—but we invite you to make your own comparison. Ask your Kuhlman representative to show you the Kuhlman "Hot Paint" finish. You'll see the difference in a glance!

5716 b

KUHLMAN

ELECTRIC COMPANY

GENERAL OFFICES: Birmingham, Michigan



PREFORMED ARMOR-GRIP SUSPENSION UNITS provide a

Pretty Soft Life for a Conductor

... cradled in durable neoprene

No vibration fatigue here. The Preformed Armor-Grip Suspension Unit (AGSU) eliminates failure by eliminating stress concentration.

The conductor is cushioned in a split neoprene core, held securely by Preformed rods that never lose their tight grip, and supported in an aluminum housing. Conductor is protected and longitudinal stresses are distributed through the entire length of the rods—not at one point.

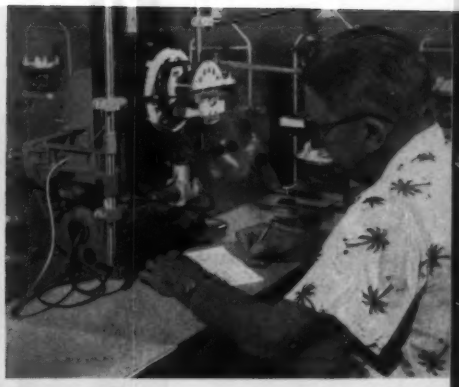
Like other Preformed line accessories, the AGSU obsoletes bolted hardware. It's easier to apply (no tools needed), costs less, does a better job. You get mechanical strength and electrical protection, and—because of the smooth contour and large diameter of the rod ends—corona emission and radio influence are minimized.

Want to know more about the Preformed Armor-Grip Suspension Unit —or see the application demonstrated? Write PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . in 10 years the leading manufacturer of armor rods, dead ends, Guy-Grip dead-ends and other line accessories.

PLP

You can look up to Preformed

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.



All incoming meters are tested, results tabulated on permanent record cards in the Florida Power Corporation Meter Shop.

S. B. Vaughn, Superintendent of Meters, Florida Power Corporation, checks the meter accuracy records in his department.

for impartial proof of watthour meter performance

LOOK TO YOUR OWN RECORDS!

Do you want the real facts about your watthour meters and the kind of service they give? Then check your own company records.

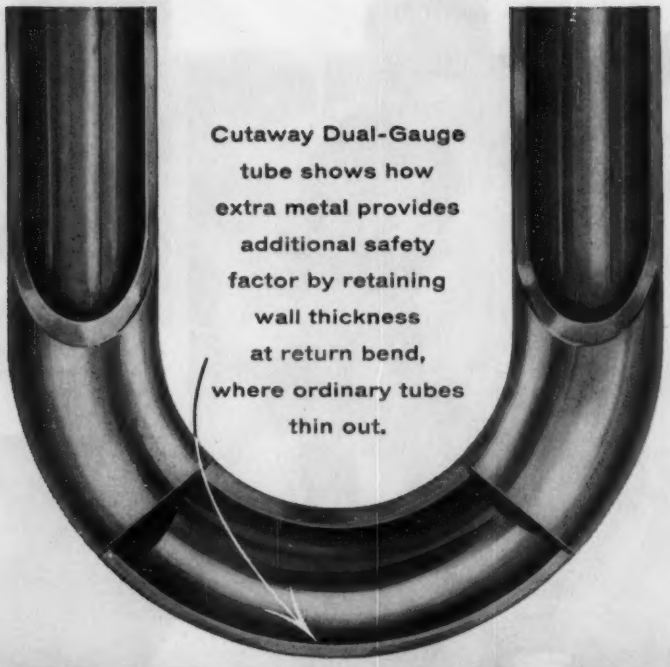
Your metering team—the men on the bench, the metering superintendent, the girls in the record department—are all familiar with Sangamo Meters and their fine performance. We think that you will be surprised, and pleased with the sustained accuracy of the Sangamo Meters on your lines—even after years and years of service.

Sangamo J2 Meters give you straight line accuracy to 100 amperes . . . corrosion-resistant construction . . . high torque, lifetime bearing system . . . high insulation level . . . and *slow disk speed*—five good reasons why the J2 is your best investment in a watthour meter.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

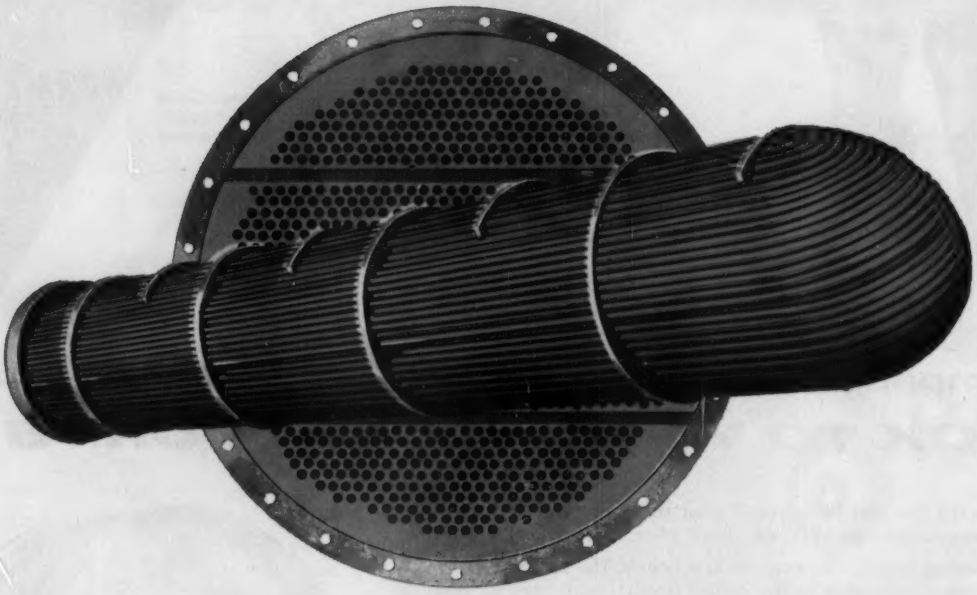
JM57-6



Cutaway Dual-Gauge tube shows how extra metal provides additional safety factor by retaining wall thickness at return bend, where ordinary tubes thin out.

Specify

DUAL-GAUGE



First for Lasting Quality—from Mine to Market!

To keep tubes uniformly strong
in condensers, feed water heaters,
heat exchangers and similar equipment...

PHELPS DODGE

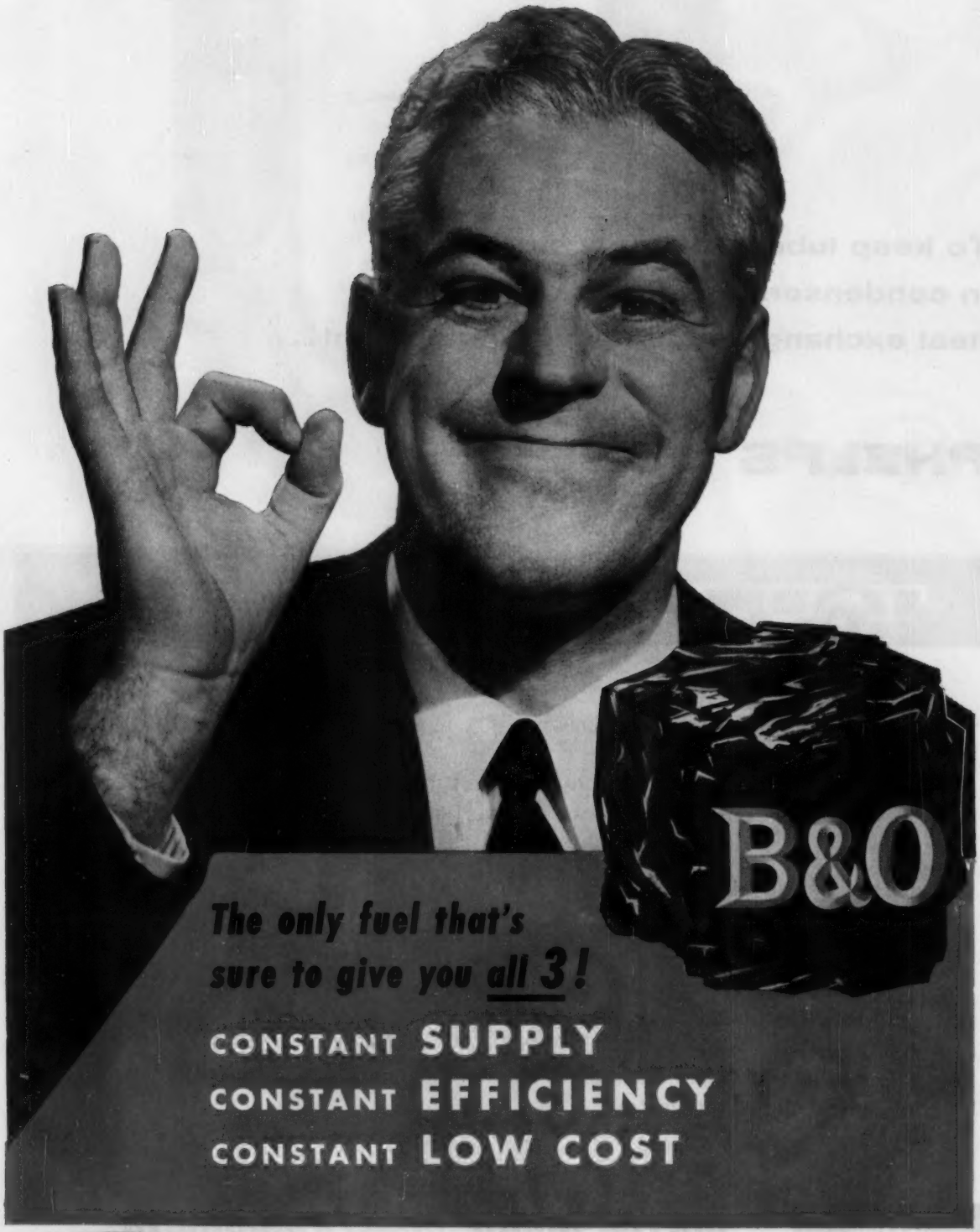
TUBING!

- Provides heavier wall thickness:
  - **a.** At one or more points in tube length to compensate for thinning on outer portions of return bends.
  - **b.** At points of support.
  - **c.** At tube ends to meet special requirements.
- Produced in all standard sizes or manufactured to the particular design requirements of individual customers.
- Available in Cupro-Nickel, Red Brass, Aluminum Brass, Admiralty metal and Muntz metal.

PHELPS DODGE COPPER PRODUCTS CORPORATION

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.



B&O BITUMINOUS COALS FOR EVERY PURPOSE

Ask our Man! BALTIMORE & OHIO RAILROAD, BALTIMORE 1, MD. *Phone* LExington 9-0400

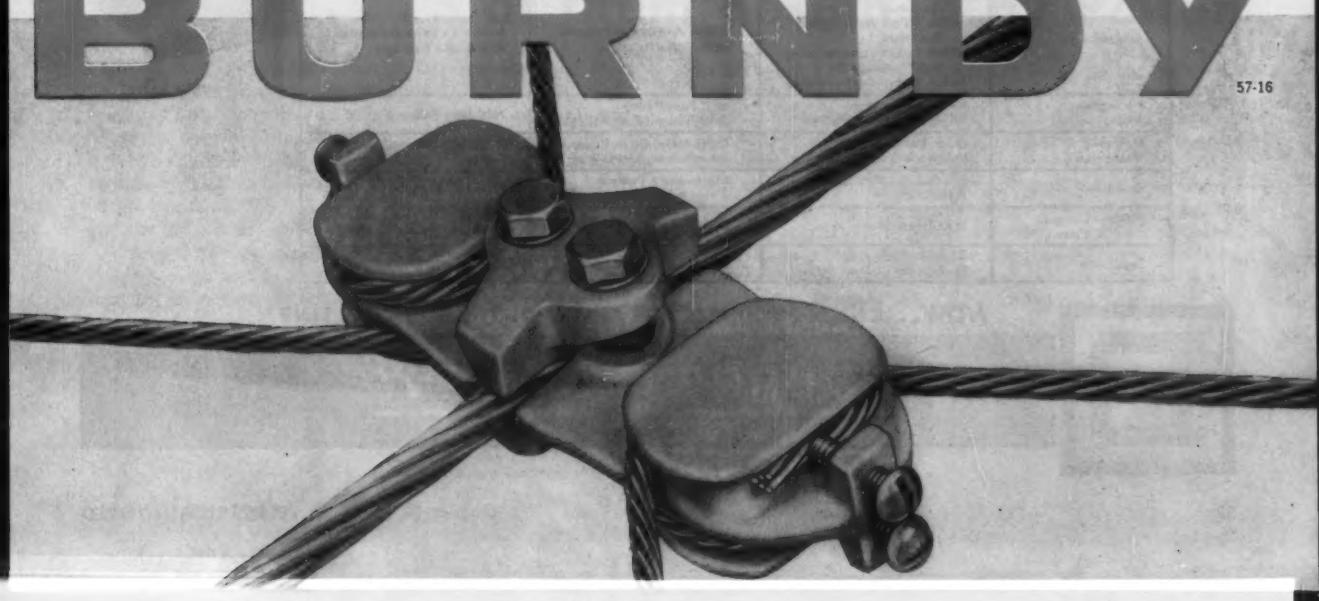
SPANTAP

first fully engineered MID-SPAN TAP for cabled secondaries

- The phase SPANTAP, above, is installed on the run by tightening a single bolt! The insulating cover halves snap together...securely held by humpback cotter pins. Knockouts in the insulating cover permit insertion of taps without removing this cover!
- Up to 4 individual taps can be taken from one SPANTAP! Each service can be added or removed from the installed and fully-insulated SPANTAP... at any time!
- The stripping length for each tap is indicated on the face of the cover! The connection is made secure by tightening pressure bar assembly from the bottom of the SPANTAP.
- One neutral SPANTAP, below, deadends and connects up to 4 service drop neutrals to the neutral of the secondary — without disassembly of the connector.
- The service drop neutral is wrapped around the SPANTAP V-groove which produces a wedge-locked grip on the conductor. As stresses increase, the simple connection grows tighter!
- No further gripping action is required but the neutral SPANTAP has an anchor screw to secure each connection against severe winds and storms!
- Write for complete technical specifications. Burndy, Norwalk, Connect., Scarboro, Canada.

BURNDY

57-16



GET SQUARE D SAFETY SWITCHES AND BENEFIT FROM THE NEW NEMA STANDARDS

NEMA standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser, as well as to assist the purchaser in selecting and obtaining the proper product for his particular need.

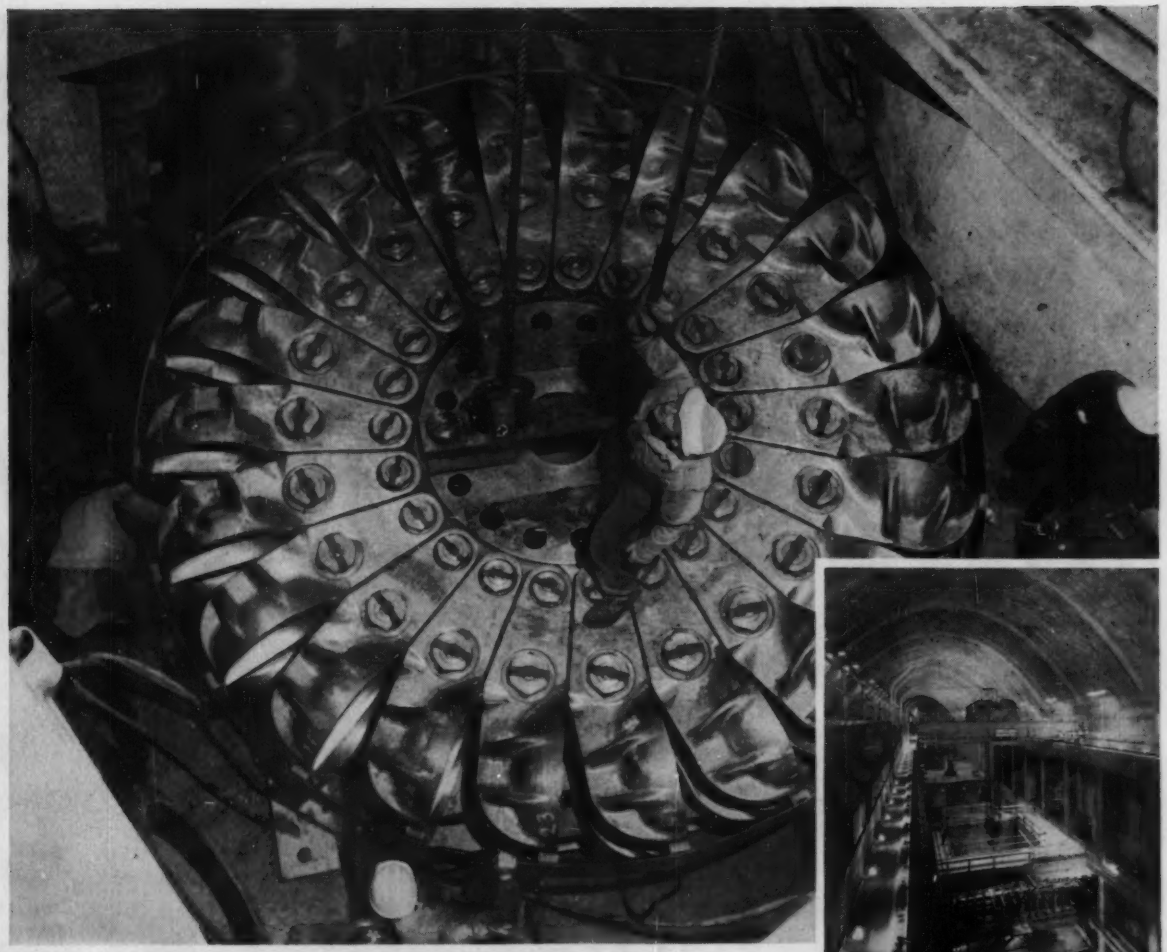
Square D's quick change to the new standards gives you the performance and safety which NEMA standards assure.

Square D Safety Switches cost no more —why settle for less?

DESCRIPTION	HEAVY DUTY New	NORMAL DUTY formerly Types H, S, or A	LIGHT DUTY formerly Types D or G
Rating-Ampere Voltage	30—600 250 or 600V AC, DC	30—1200 250 or 600V AC, DC	30—200 250V AC
Enclosure	NEMA 12 • Industrial Use (Gasketed) NEMA 4 & 5 • Water-tight & Dust-tight NEMA 7 • Explosion-resisting Class I—Group D NEMA 9 • Explosion-resisting	NEMA 1 • General Purpose NEMA 3R • Raintight	NEMA 1 • General Purpose NEMA 3R • Raintight
Horsepower Rating	NEC Fuse Ratings Dual-Element Fuse Ratings	NEC Fuse Rating Dual-Element Fuse Ratings	NEC Fuse Rating
Operating Mechanism	Quick-Make, Quick-Break Independent of Handle	Quick-Make, Quick-Break Independent of Handle	Positive Make, Positive Break Spring Assisted
Cover	Interlocked & Padlock Attachment	Interlocked & Padlock Attachment	Padlock Attachment
Plating—Current Parts	Extra-Heavy Silver	Silver	
Endurance	Maximum Endurance Far Exceeds UL Standards	Exceeds UL Standards	Meets UL Standards

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY



Pelton-designed vertical multi-nozzle impulse turbine runner being installed in Aluminium Company of Canada Limited's Kemano powerhouse, British Columbia.

Positions being prepared for Units 5, 6 and 7 in the Kemano powerhouse, which is built a quarter of a mile inside the foot of a mountain.

At Canada's Kemano powerhouse . . .

Mammoth vertical multi-nozzle impulse turbines . . . 3 of them designed by Pelton

Eight vertical multi-nozzle impulse turbines—believed to be the largest in the world—will produce a total of 1,200,000 hp at Aluminium Company of Canada Limited's Kemano powerhouse in British Columbia. Three units were designed by B-L-H's Pelton Division, San Francisco. Each nozzle impulse turbine is rated to deliver 150,000 hp at 327 rpm under an effective head of 2500 ft. Two turbines are already in operation and the third is scheduled to join them in a matter of weeks.

The vertical multi-nozzle impulse turbine represents one of Pelton's most significant contributions to hydroelectric progress. By its nature the impulse turbine is a relatively large, low-speed turbine, as contrasted with the reaction type. Since its parts are less subject to wear, it keeps its high efficiency with little maintenance for long periods of time. For high head installations, and in cases where large unit capacity is required, the vertical multi-nozzle impulse turbine, pioneered and developed by Pelton, is the ideal choice.

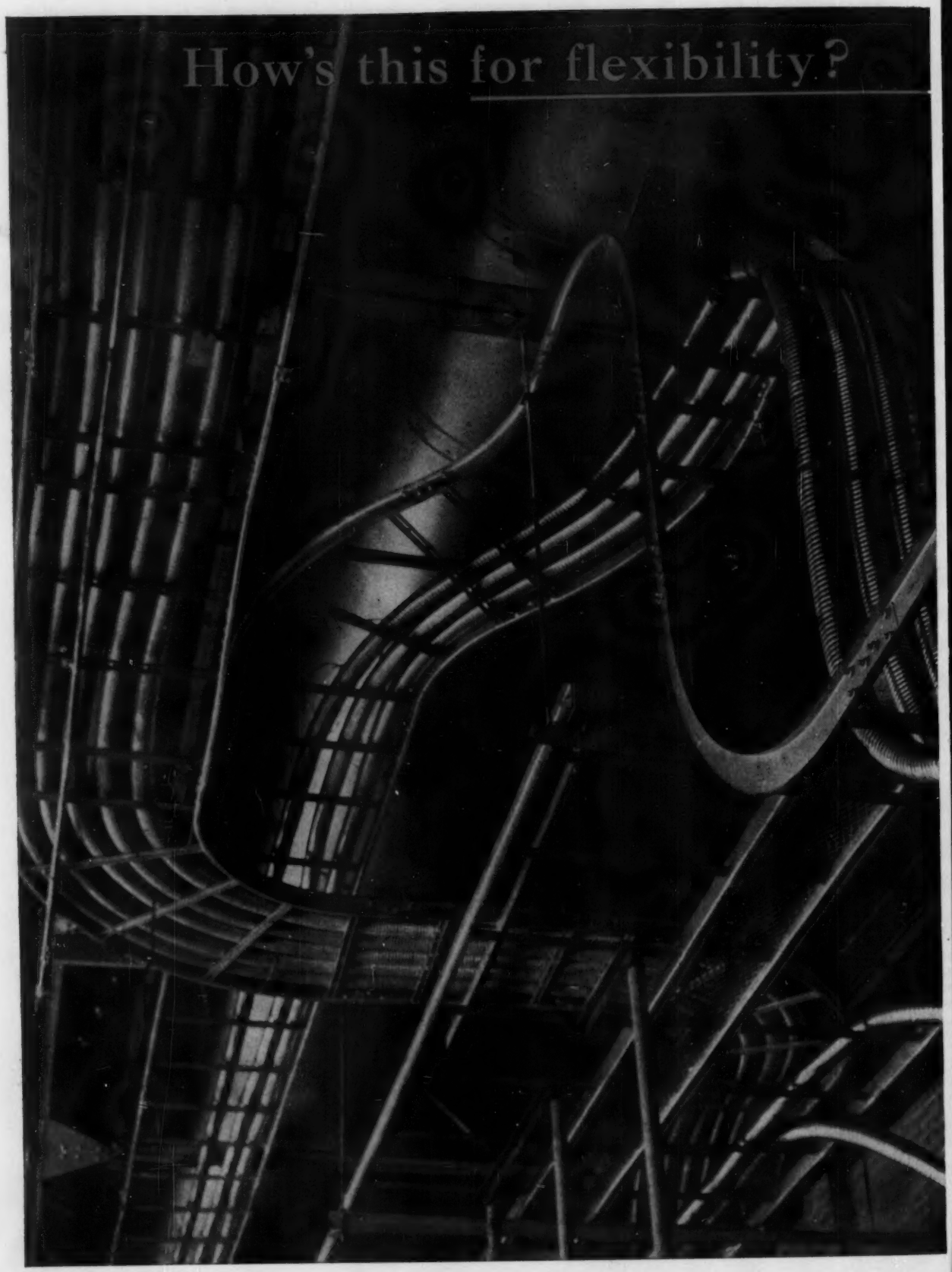
In addition to impulse turbines, Pelton manufactures reaction type turbines, hydraulic turbine governors, butterfly valves, spherical valves, pressure regulators, surge suppressors, waterworks valves, large centrifugal pumps, duplex strainers, dynamic balancers, etc. For illustrated bulletins, write B-L-H Corporation, Philadelphia 42, Pa., or Pelton Division (B-L-H), 2929 Nineteenth St., San Francisco 10, Calif.

Pelton Division San Francisco, Calif.

BALDWIN • LIMA • HAMILTON

Hydraulic turbines • Valves • Governors • Centrifugal pumps

How's this for flexibility?



Design for the future NOW with Tiger Brand Armorlokt

BETTER THAN WORDS, the big picture shows the complete flexibility of Tiger Brand Armorlokt when installed in an open rack system. New cables can be added easily *any time* when your electrical load increases . . . as it surely will in the years to come.

Remember the splicing advantages of this cable, too. It's not likely, but if Armorlokt is damaged by a crane or some other object, you simply insert a splice box. Compare this to cable in rigid conduit; if it's damaged, you have to pull the entire cable out (if you can *get* it out) and start all over.

If you want to look to the future while designing today, think seriously about Tiger Brand Armorlokt for new construction or modernization. It is made in a complete range of sizes and constructions. Just ask your AS&W salesman.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors

Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, New York

Flexible Armorlokt eliminates strain at boxes.

Splices can be made anywhere along cable.

Watch the United States Steel Hour on TV every other Wednesday (10 p.m. Eastern time).

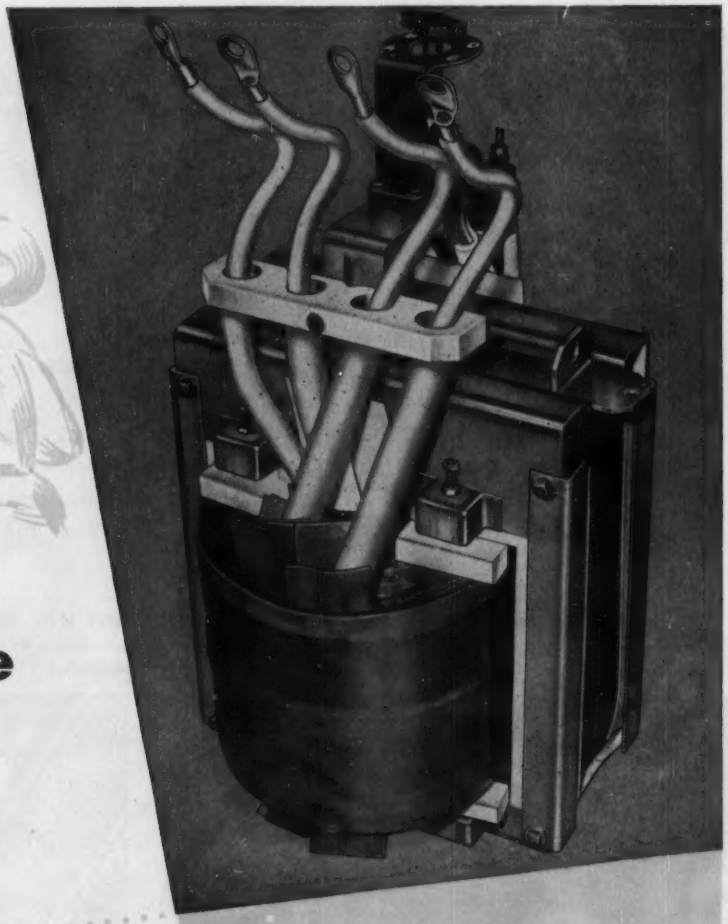
USS TIGER BRAND ELECTRICAL WIRE & CABLE

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- ASBESTOS WIRE AND CABLE
- MOLD CURED PORTABLE CORD
- SHOVEL & DREDGE CABLE
- PAPER & LEAD CABLE
- VARNISHED CAMBRIC CABLE
- INTERLOCKED ARMOR CABLE
- SPECIAL PURPOSE WIRE & CABLE
- AERIAL, UNDERGROUND AND SUBMARINE CABLE

USS TRADE MARK

UNITED STATES STEEL



Rugged Performance

built into core and coil assembly of Central Distribution Transformers

Only the best raw materials, design, workmanship and inspection go into core and coil assemblies of Central Distribution Transformers.

Grain oriented, cold rolled steel is used in the wound core design. Maple blocks are attached to the sturdy frame on all core and coil assemblies, 15 KVA and above, to prevent shifting of the coil under overload or short circuit conditions.

The tap changer has a glazed porcelain body and high conductivity copper alloy contacts. The molded bakelite handle extends above the hot oil level to assure easy and positive operation of the high pressure spring loaded contactor. A fiber board provides clear indication above oil of the position of the tap changer.

This rugged construction of the core and coil assembly is an important reason why Central Distribution Transformers have gained wide acceptance in the Electrical Industry.

A type for every need—from the smallest to the largest.

NEMA

Designers and Manufacturers of Transformers only

CTC

CENTRAL

TRANSFORMER CORP.

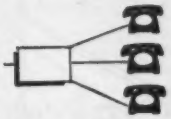
PINE BLUFF, ARKANSAS

Sales Offices in principal cities

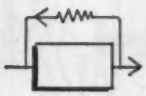
Pacemakers in the technology of our electronic age

Certain discoveries, inventions and developments of Bell Telephone Laboratories have been truly epochal in their effect upon the technology of our time. Each has come out of a single quest—a search for ways to make telephony ever better. But many have opened the way to exciting advances in TV, movies, radio, horology, astronomy. Here are ten of Bell Laboratories' contributions to the modern world.

Electronic amplifier. First high-vacuum electronic amplifier. Made possible long distance telephony and then opened the way to radio broadcasting.



Wave filter. Precisely separates bands of frequencies. Provided major key to economical sharing of the same wires by many voices or radio programs. Indispensable control tool in radio, television and radar.



Negative feedback amplifier. Provides distortionless and stable amplification. Made possible the enormous, precisely controlled amplification needed in long distance telephone calls. The principle is now basic in high-quality amplifiers for radio, TV and high-fidelity reproduction.

Quartz crystal. Standard super-accurate quartz crystal oscillator developed for frequency controls in radio telephony. Has also become the standard control for clocks in world's astronomical laboratories.

Coaxial cable system. Hollow tube with a central conductor was developed to transmit hundreds of voices simultaneously. Now also provides long distance carrier for TV in partnership with microwave beams.

Transistor. Tiny solid-state device uses extremely small amounts of power to amplify signals. Makes possible electronic telephone switching and much smaller hearing aids, radios, TV sets and electronic computers.

Dial system "brain and memory." Takes over your call and sees that you are connected in the best and quickest way. Newest example: Direct Distance Dialing from home telephones to any part of the nation.

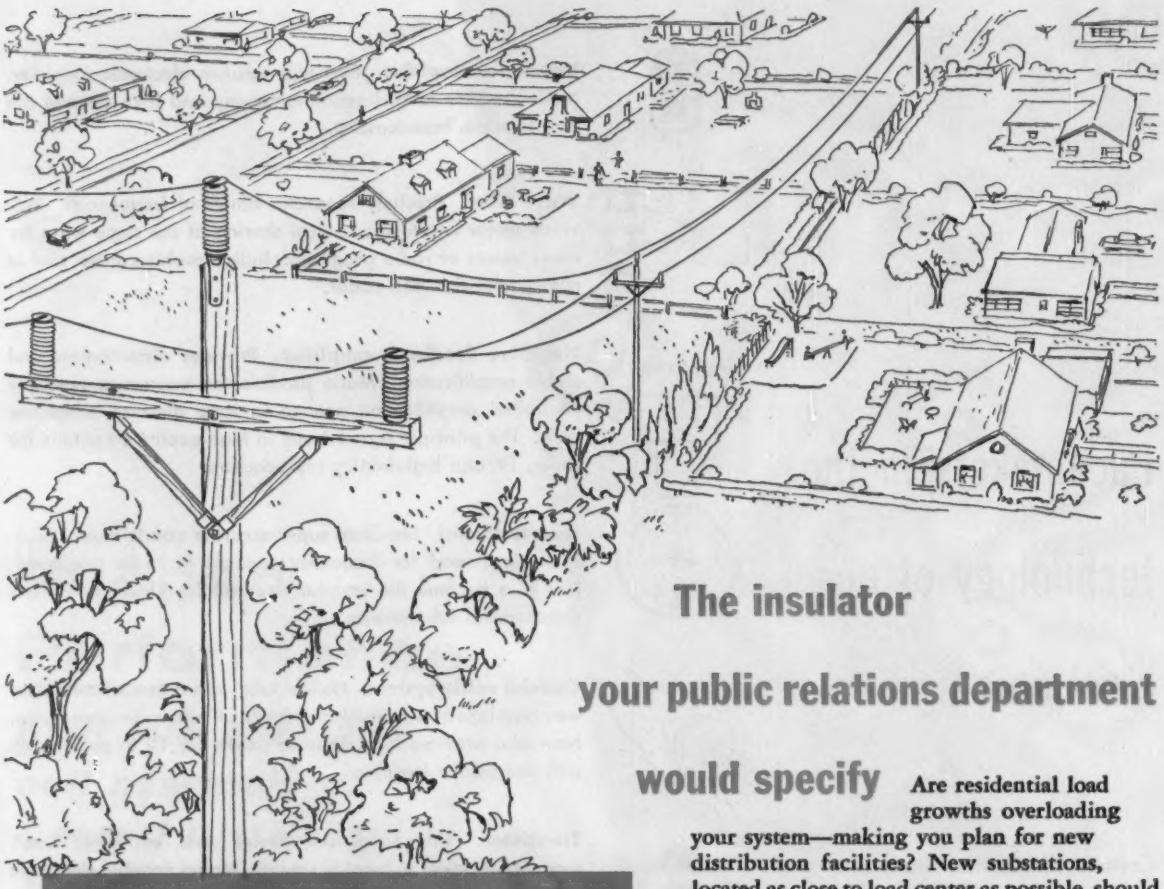
Waveguide. Hollow conductor transmits high-frequency waves. From this came the "pipe" circuits that are essential to radar and very short-wave radio communications.

Microwaves. Bell Laboratories developed long distance microwave transmission. It operates by focusing radio beams from station to station, carries cross-country telephony and TV.

Radio astronomy. This great new science began in the study of radio interference at Bell Laboratories . . . with the tremendous discovery that radio waves emanate from the stars.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT



The insulator

your public relations department

would specify

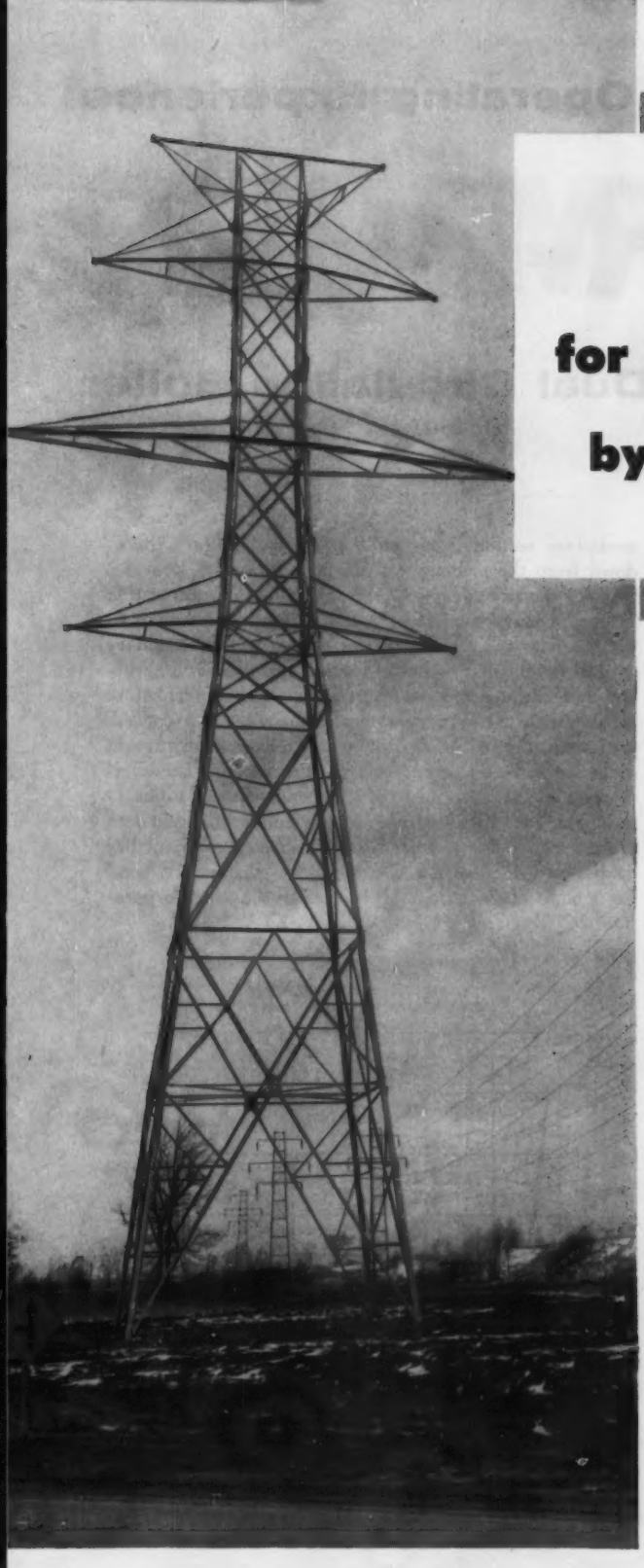
Are residential load growths overloading your system—making you plan for new distribution facilities? New substations, located as close to load center as possible, should be your best solution—if sites are available . . . and *if* a subtransmission line through a residential area doesn't encounter customer objection. If you build such a line on large imposing structures, it probably will!

There's a wonderful way to do it, however, and one which will retain customer goodwill! A line up to 69 Kv, and even higher voltages, can go on "small" unobtrusive wood-pole structures, with single cross-arms—and compact, sturdy good-looking Lapp Line Posts. In addition to sparing customer feelings, you'll be saving money, too, in initial cost, and maintenance; service records from coast-to-coast show that such lines for subtransmission voltages are more reliable and trouble-free than any others. And particularly important for lines in residential areas is the fact that Lapp Line Posts are inherently free of RIV and TV interference at rated voltages.

Once you've installed such a line, your future problems diminish. A trim, good-looking, high performance line on Lapp Line Posts serves as a beautiful example of a complaint-free installation. It will be easier to get right-of-way for *future* transmission lines.

Lapp Line Posts, either with tie-wire head or clamp-top, are available in voltage ratings through 88 Kv.

Lapp Insulator Co., Inc., Le Roy, N. Y.



138 more towers for NIAGARA MOHAWK POWER by AMERICAN BRIDGE

THE TALL TOWER shown here is one of 138 now being erected to carry a new 230 kv line of the Niagara Mohawk Corporation, a frequent customer of American Bridge over the past 15 years.

Running from Huntley to Gardenville, N. Y. (near Buffalo), it follows an existing 115 kv line of the same Company. The new towers have an average height of 123′. The maximum span is 1,100′ and the minimum span is 400′.

3,500 tons of steel was involved in these towers—about 1,050 tons of which was USS MAN-TEN. The use of this high strength steel in all main legs and some of the main bracing—about 7½ tons per tower—reduced tower weight by 2,400 pounds (about 165 tons on the entire line), or about 5% savings in overall weight.

American Bridge has been designing and fabricating transmission towers since 1911. We have the experience, the facilities and the "know-how" to furnish you with quality structures competitively and on time. It will pay you to call our tower experts on your next job.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

AMERICAN BRIDGE
Transmission Towers

UNITED STATES STEEL

Nine Years of Operating Experience

SUPER-PURE

with the FW Dual Circulation Boiler

Low carryover of silica and solids, at design pressures up to 2200 psi, with low-purity feedwater and make-up as high as 100%, proves soundness of dual circulation design

EXPERIENCE with the FW dual circulation steam generator — now in the tenth year of successful operation — clearly demonstrates its effectiveness in producing high purity steam from waters which had previously been considered unsatisfactory for high-pressure boiler make-up. The following advantages have now been fully realized in installations with design pressures up to 2200 psi, and make-up as high as 100%.

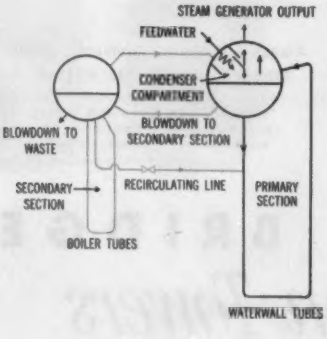
Sharply reduced carryover of silica and solids, preventing costly fouling of turbine blades.

Low concentration in high-duty furnace section, resulting in minimum tube damage and reduced boiler maintenance.

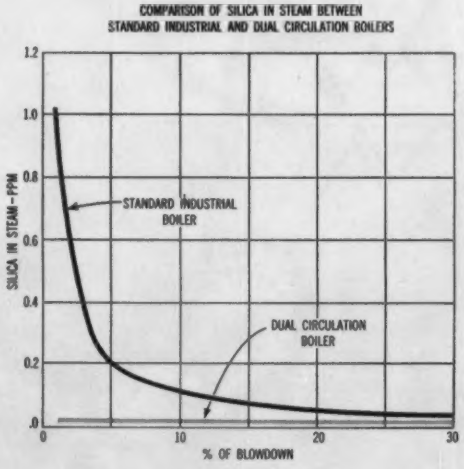
Reduced blowdown with lower heat loss and smaller heat recovery equipment.

Reduced feedwater purity requirements, permitting less expensive water treatment even with high make-up.

The dual circulation boiler utilizes *two* separate heat absorbing sections — a radiant *primary* section (where most of the steam is generated), and a low-heat-absorption *secondary* section (convection portion of boiler). Blowdown from the primary, usually at a high rate, provides feed for the secondary section. This reduces concentration in the primary section to a much lower value than in the secondary section. Steam generated in the secondary section is returned to the primary drum where it is scrubbed by feedwater and condensed in whole or in part before mixing with the primary steam. Even with high concentrations in the secondary, low steam release rates prevent excessive moisture carryover from this section. The effectiveness of this design in reducing carryover of silica to the turbine is well illustrated by the comparative test data plotted below for the conditions indicated. For further details on FW Dual Circulation Steam Generators, send for a copy of Bulletin B-50-11. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*



Simplified flow diagram showing principle of Dual Circulation. Secondary section and blowdown to secondary section are shown in red.



Drum Operating Pressure — Approx. 1500 psi.
Total Soluble Solids in Feedwater — 150 ppm
Silica (SiO_2) in Feedwater — 1 ppm
Evaporation in Secondary Sec. — 33% of total boiler output

FOSTER

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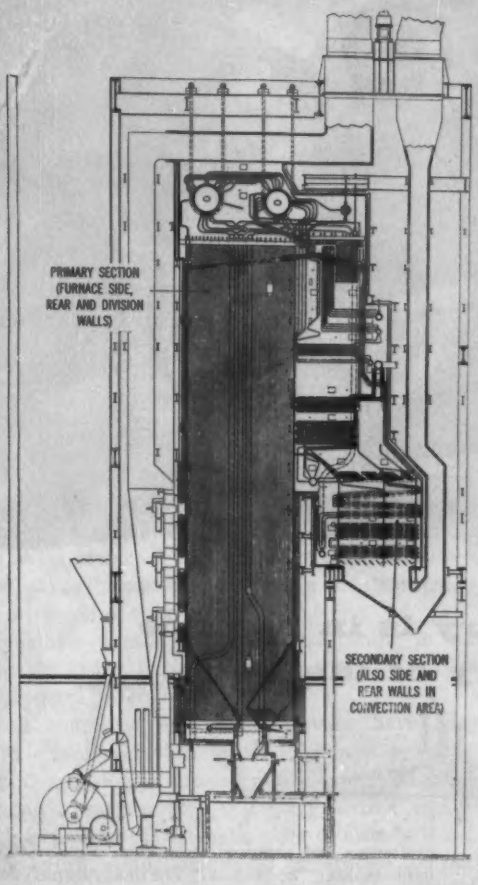
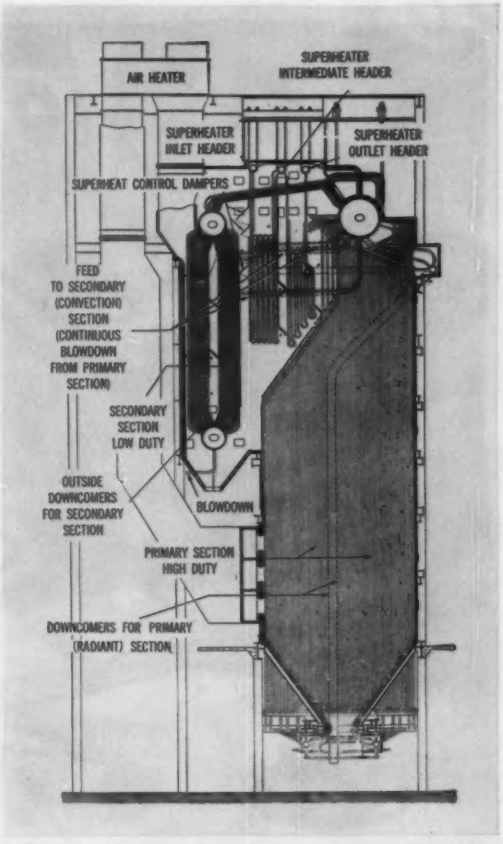
in Generating

STEAM

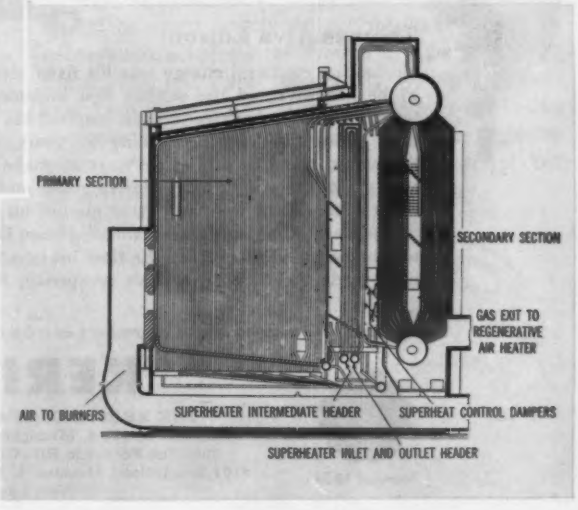


▲ Cross section of Dual Circulation reheat steam generator designed for a maximum continuous output of 1,450,000 lb/hr with a design pressure of 2075 psig, normally operating with low make-up. Steam temperature of 1000F is maintained over a load range from 500,000 lb/hr to maximum rating. The primary section consists of waterwall surface exposed to radiation from the flame and gases while the secondary consists of extended surface heated by convection.



▲ Cross section of a three-drum Dual Circulation Steam Generator designed for 300,000 lb/hr, 1500 psi, 900F, with 100% make-up. Steam-water mixture leaving wall tubes passes through washing and separating compartments in the primary drum. Water from the high-duty section is continuously blown down to the low-heat-absorption secondary section, shown in red. Steam from the secondary is returned to the primary and condensed by incoming feedwater.

Cross section of a two-drum Dual Circulation Steam Generator designed for 300,000 lb/hr, 700 psi, 750F, with high make-up. Here the primary and secondary sections are segregated within the single upper drum. The waterwall tubes comprise the high-heat-absorption primary section and the boiler bank or convection section comprises the low-heat-absorption secondary section. ▼



WHEELER

PARIS • ST. CATHARINES, ONT.

Human history is in essence a history of ideas*

*H. G. Wells 1895

Thomas Alva Edison

Harnessing electrical energy was his fixed idea At 27 he had invented the world's first incandescent lamp. Edison, a practical genius, inspired his team with enthusiasm. In the ensuing 57 years of his life he led them to find more ways to make electricity produce sound, light, motive power and heat —with more ideas than any other man of his time.

The Kerite Company was established when Edison was but eight years old. By the time his inventions were ready to add to America's prosperity, Kerite craftsmen had acquired more than a generation of cable-making "know-how." The newly formed utility and railroad companies of the 1870's relied then, as do their successors today, on the unfailing service and long life of Kerite cable.

As power loads increase year by year, the inherited integrity and skill of today's Kerite craftsmen insure that the demands of far-sighted utility, industrial and railroad engineers will be amply fulfilled in the years ahead.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

KERITE CABLE

Founded 1854

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston;
4101 San Jacinto, Houston 4, Texas; 1010 Euclid Avenue, Cleveland 17, Ohio;
29 West Lancaster Avenue, Ardmore, Pa.

EDITORIALS

Water Heating: Simplify It to Sell It

Electric water heating has been discussed on this page many times. Numerous facets have been presented. But one of its greatest needs today is standardization of tank sizes, element ratings, and safety controls. There have been encouraging developments along this line of late, but much remains to be done.

An industry committee has been set up to grapple with the problems of standardization. This committee has come up with recommendations which it feels can meet most of today's and tomorrow's needs for 75% of the all-electric homes. Its next step is to determine whether these proposed standards are acceptable to a majority of utilities. If they are, then the committee will be in a position to give water heater manufacturers some firm recommendations.

Perhaps the best way you can assist the committee is to take a long look at your company's water heater requirements.

- Can they be simplified?
- How do they comply with specifications put out by NEMA? How do they differ? What can be done about it?

There seems very little doubt that electric utilities must be in the electric water heating business, like it or not. Promotion of the all-electric home, and the continually narrowing gap between electricity and competitive fuel costs has seen to that. As long as utilities are going to be in the business, they must provide an attractive service at a profit. Simplification of electric water heater design requirements is a necessary early step toward that end.

"The Play's the Thing"

Imagine, if you will, a play which has been very carefully written, the theater rented, the scenery, elaborate and expensive, set in place, and the audience in its seats. But as the play unfolds, only a small part of the cast comes on-stage and then speaks only a portion of their lines.

Something a little like this is happening in our industry's "Live Better . . . Electrically" market development program.

Well conceived and detailed plans have been drawn. Promotional materials have been provided, symbols and slogans created and introduced—all to form an attractive plot and stage setting against which to present the dramatic story of electric living.

The entire production can be jeopardized if a part of the cast long remains off stage and unrehearsed.

Live Better . . . Electrically, as the highlights of its industry report on page 77 show, is in for a long run. The statistics shown must provide great satisfaction to all those who have done so much to provide the consumer and industry acceptance it enjoys. As impressive as these figures are, the play is still not reaching as large an audience as it might. What is needed is more and more local action played against the national backdrop of the well-known and accepted Live Better . . . Electrically theme.

Industry support can be both widened and deepened. Those utilities and manufacturers who have not supported the program to date must be encouraged to do so. Those who have supported it should be induced to do more. And these increased efforts should be spent largely on getting local dealers to become more actively involved in it. Live Better . . . Electrically has done remarkably well in its two-year "run," but if it is to play to the ever-increasing audience it deserves, it will have to get even greater billing. We have the stage, scenery, and script, but without all the actors we do not have a play.

And after all, the play's the thing.

VOGEL: Major Policy Decisions Have to Wait

TVA Outlook: Era of Stormy Transition

- **Senate-passed financing bill puts a $750-million ceiling on bonds, limits expansion**
- **Death of Director Paty leaves Board Chairman Vogel (left) without a quorum; may bring Jones' interim appointment**
- **Gloom descends on the agency's area**
- **Von Tresckow proposes sale of TVA power facilities to communities it serves**

The turbulent waters that have boiled around and about the Tennessee Valley Authority are nearing a flood stage.

In Washington, weary, suitcase-packing House members are, at this writing, arguing about financing future TVA construction and what geographical limitations, if any, should be imposed on the 24-year-old power giant. The Senate is sitting tight on confirming the appointment of Arnold R. Jones as a TVA board member.

Area Sees Troubled Waters

In Knoxville, Tenn., the heart attack that claimed Dr Raymond R. Paty, TVA board member since 1952, reduces the three-man governing board to one—Chairman Herbert D. Vogel. In the agency area, public power leaders foresee troubled waters unles a "miracle" nomination of a top TVA executive is made.

And in New York City, Walter von Tresckow, head of a financing and consulting firm, will soon submit a proposal for sale of the agency's power facilities to 150 communities TVA now serves.

Here's how the events are unfolding, pushing TVA into what appears to be an era of stormy transition:

I. TVA Bond Financing

By a night-time vote of 61 to 20 the Senate passed a bill which would allow TVA to issue revenue bonds to finance future power plants. Introduced by Sen Robert S. Kerr (D-Okla.) and sponsored by a group of other southern Senators the measure amalgamates some provisions of a compromise bill introduced by Sen Cooper (R-Ky.).

Key features of the Senate-passed measure are these:

- A $750-million ceiling on the bond amount TVA can issue.
- Requirement for repayment of appropriations at the rate of $10 million a year.
- Amendment of an expansion clause that, opponents of the bill claimed, actually opened to TVA a vastly broadened area (see map). The amendment would provide TVA expansion in the area now served, and where TVA is serving electric cooperatives or communities on its borders it can go five miles beyond but no farther without Congressional approval.

The measure has gone to the House. Observers in Washington and Tennessee, though, note that the House appears divided on whether to act this year or let the measure ride to 1958. Chances are strong, many say, it will be carried over to January.

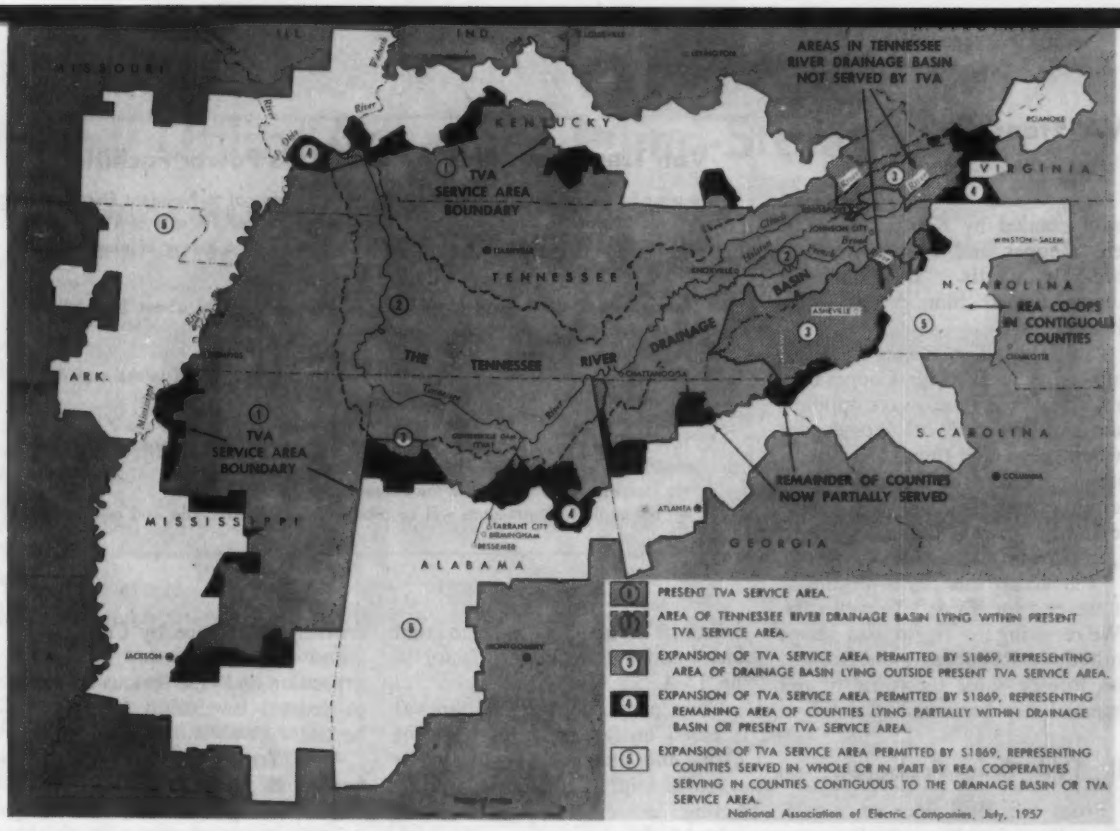
Rep Clifford Davis (D-Tenn.), sponsor of a self-financing bill, says he has no intention of calling up his measure this year. Davis is still studying the Senate-passed bill but adds it's too close to the end of the session to get a good bill through the House.

Other sources report, however, the real reason why Democrats don't want to push TVA financing this year is because they don't think they can muster the votes to get a bill through without crippling amendments.

GOP Says Congress Lacks Control

Although the Senate vote indicates much bipartisan support, some Republicans are still unhappy. They say there is insufficient Congressional control over TVA's actions.

The $750 million provided in the Senate bill will supposedly take care of TVA's expansion needs for the next five years. The Kerr bill requires that the agency notify Congress before constructing any new power project. If Congress does not disapprove within 60 days, TVA can go ahead on its own. Critics charge that this is a loophole since,


AREAS IN TENNESSEE RIVER DRAINAGE BASIN NOT SERVED BY TVA
TVA SERVICE AREA BOUNDARY
TENNESSEE RIVER DRAINAGE BASIN
REA CO-OPS IN CONTIGUOUS COUNTIES
REMAINDER OF COUNTIES NOW PARTIALLY SERVED
TVA SERVICE AREA BOUNDARY
KENTUCKY
VIRGINIA
N. CAROLINA
S. CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
ARK.
MISSOURI
TENNESSEE
ATLANTA
PRESENT TVA SERVICE AREA.
AREA OF TENNESSEE RIVER DRAINAGE BASIN LYING WITHIN PRESENT TVA SERVICE AREA.
EXPANSION OF TVA SERVICE AREA PERMITTED BY S1869, REPRESENTING AREA OF DRAINAGE BASIN LYING OUTSIDE PRESENT TVA SERVICE AREA.
EXPANSION OF TVA SERVICE AREA PERMITTED BY S1869, REPRESENTING REMAINING AREA OF COUNTIES LYING PARTIALLY WITHIN DRAINAGE BASIN OR PRESENT TVA SERVICE AREA.
EXPANSION OF TVA SERVICE AREA PERMITTED BY S1869, REPRESENTING COUNTIES SERVED IN WHOLE OR IN PART BY REA COOPERATIVES SERVING IN COUNTIES CONTIGUOUS TO THE DRAINAGE BASIN OR TVA SERVICE AREA.
National Association of Electric Companies, July, 1957

if legislation were blocked in Congress, TVA would be free to start on any project after the 60 days.

Another feature disliked by some Republicans is that TVA activities under the financing bill would not be subject to control by the Budget Bureau and issuance of bonds would not require Treasury Department approval. Finally, there is the stipulation in the measure giving TVA a utility responsibility to supply electric power to meet all of the area's requirements. Critics claim this gives the agency the leverage to expand in perpetuity.

In map above, National Assn of Electric Companies shows how original Kerr bill would let TVA expand from present 80,000 to 192,000 sq. mi.

II. Finding-Board Members

The storm that has followed Pres Eisenhower's nomination of Arnold R. Jones for the TVA board hasn't waned following the death of Dr Paty. Jones, deputy director of the Budget Bureau until last week, was the Administration's choice to fill the vacancy of retired Dr Harry A. Curtis. Jones' nomination is now up for Senate confirmation. But pro-TVA Democrats are of no mind to hurry action on his nomination.

TVA's two board vacancies brings up the question of whether Vogel can function effectively, if at all. Congressional sources report that without a quorum Vogel will be unable to make any major policy decisions. Lacking a financing bill from Congress, on the other hand, he is unlikely to be confronted with any major policy decisions.

So for the next few months it appears TVA will cruise along on momentum, unless the President makes interim appointments. The big problem is finding another man for the job. It took Eisenhower months to locate Jones. A number of people approached by the White House declined the job.

Why Not a TVA Man? Area Asks

But, according to TVA supporters in Tennessee, it's no problem at all. Power men from three agency-area states are urging the nomination of either G. O. Wessenauer, TVA power manager, or A. J. Wagner, TVA general manager.

Rural Electrification Administration co-op leaders and officials of Citizens for TVA, Inc, say that, with the death of Dr Paty and Dr Curtis' retirement, the TVA board doesn't have any member who is familiar with agency operation.

These spokesmen hold little hope, though, that Eisenhower would follow such suggestions. Several say they're convinced Sherman Adams, presidential assistant, will select the appointees to fill the vacancies as he selected Vogel.

'TVA Is Doomed': Nelson

"Unless a miracle happens, TVA is doomed," says Floyd Nelson, Lincoln County Electric Membership Corp manager. "I haven't any hope that the President will appoint anyone friendly to TVA."

George Dempster, former Knoxville mayor and former Citizens for TVA president, says Wessenauer "would be a natural" for the post. "He would meet all the specifications. It will take a man with strong character to stand up to Vogel, and Wessenauer would back right up to the President himself for what he thought was right. And he would know what was right."

"Either Wessenauer or Wagner would be wonderful," opines J. C. Hundley, executive secretary, Tennessee Rural Electric Cooperative Assn, "but I'm afraid that's too good to be true." Hundley believes Rep Howard Baker (R-Tenn.) would also be a good man. Baker was

TVA Transition

(*Continued from page* 71)

recommended by Kentucky's GOP Sens Cooper and Morton to succeed Dr Curtis. "But Sherman Adams turned him down," says Hundley.

Paul Tidwell, manager of Meriwether-Lewis Electric Cooperative in Centerville, Tenn., says appointment of Wagner or Wessenauer "would be a fine thing. . . . But I just can't believe the President would permit anyone that close to the business, who knows that much about it, to become a director."

"I'm afraid this is the beginning of the end for TVA," Tidwell says. "We're going to be in bad shape with three Republican directors. I can foresee some throttling of our financial requirements."

III. TVA Sale Proposed

From the 19th floor of a mid-Manhattan building, Walter von Tresckow dispatched a plan that adds another transitionary factor in the TVA tide.

"The proposal (see box above) is based on five years of study of TVA, and an endeavor to find a practical solution for the many conflicting interests which are involved," he announces. The increasing reluctance by Congress to spend more tax money on TVA's expansion and "the serious liability" of federal ownership are reasons he cites.

Von Tresckow is perhaps best known as financial adviser to the City of Memphis, Tenn., in building its own power plant.

Von Tresckow's Plan to Sell TVA's Power Facilities

In the near future my associates and I will submit a proposal to President Eisenhower through the Bureau of the Budget, and to the Congress for the sale of TVA power facilities to the 150 communities whom TVA now serves as a source of power. The proposal provides:

1. Repayment to the federal government of its investment of about $1.2 billions in the TVA power facilities.
2. Payment of interest on any unpaid balances.
3. No further investments on the part of the federal government in the expansion of TVA power facilities.
4. Confinement of TVA to its present service area.
5. TVA will be maintained as a single operating entity with its present staff and personnel.
6. No increase in power cost to the consumer in the TVA area.
7. All the capital requirements will be provided by my associates and myself.

ATOMIC PROGRESS

House Halts Federal Reactors

House coalition knocks federal reactor construction out of Atomic Power Bill, but Senate is likely to put it back

The Administration has scored a substantial victory in the House on atomic power legislation. But this may yet turn out to be the case of winning a skirmish and losing the battle.

House Republicans, backed by southern and coal state Democrats, knocked out Democratic moves to promote a federal reactor construction program. As the bill stands it leaves the development of civilian atomic power in the hands of private industry. Now the measure goes to the Senate where chances are good that everything done by Administration forces in the House will be reversed.

Eventually the final piece of legislation is going to be hammered out in conference, where the most likely outcome is compromise.

Legislation passed by the House was the authorization bill under which all Atomic Energy Commission capital expenditures have to be approved by Congress.

Democrats on the Joint Committee on Atomic Energy, where the bill was drafted, had sufficient votes to impose on AEC, over Republican opposition, a $58-million program of reactor construction.

This program called on AEC to build:

- A $40-million natural uranium, gas-cooled reactor similar to the British type. This would have been built at Arco, Idaho.
- A $15-million experimental plutonium recycle reactor.
- Five reactors proposed by three co-ops and two municipal groups.

In addition to the foregoing, Democrats knocked out of the authorization bill $4.2 million of research and development funds AEC was obligated to put up under its contract with the Power Reactor Development Co.

Republicans charged that this program was designed to promote the growth of public power and to hinder the growth of atomic power by the traditional resources of private industry.

Under the leadership of Rep. Sterling Cole (R-N. Y.), House Republicans mustered enough help from southern Democrats and Democrats from coal-producing states to defeat this entire program. They also restored funds for PRDC.

The bill as passed by the House authorizes $337 million for civilian and military development of atomic power.

In the Senate the story promises to be different. Here the Democrats are considerably stronger.

Democrat Sens Anderson, Gore, Jackson, and Pastore, all members of the Joint Committee on Atomic Energy, have indicated they will fight to restore the program knocked out in the House.

Jersey Utility Advances Pump-Storage Plan

New Jersey P&L proposes 75-Mw hydro project that would be integrated with Jersey City water supply. Plan hinges on accord over water rights

A coordinated pump-storage, water-storage project is being considered by New Jersey Power & Light Co. It would be located in Longwood Valley a few miles up the Rockaway River from Dover, N. J. The proposed project would add 75,000 kw of capacity to the NJP&L system and provide Jersey City with an additional source of needed water.

Needs Thorough Study

The utility has made no thorough study on the project because Jersey City has prior claim to Longwood Valley water. A satisfactory utility-city arrangement is required before definite planning would be considered. The NJP&L proposal would involve two reservoirs while the city's plan calls for one. Jersey City's plan would provide water only.

The project's capacity would be obtained by use of two 37,500-kw units. Each would be a Francis type, reversible pump turbine. Cost of the power plant alone would be about $9 to 10 million.

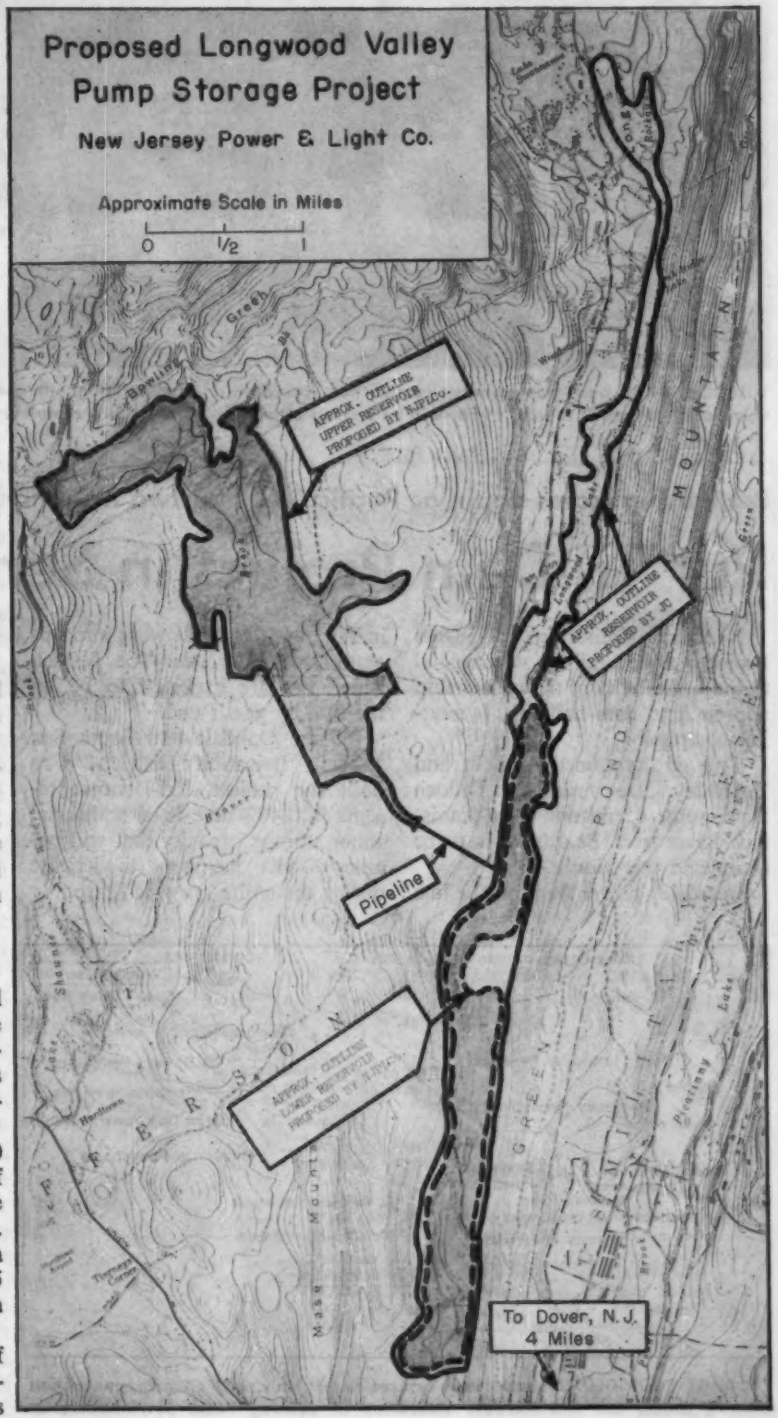
The cost of Jersey City's one-reservoir plan is estimated at $7.5 million. Under the NJP&L plan, cost of the reservoirs would be paid by the city, which would obtain additional storage capacity with two reservoirs.

Reverses Function

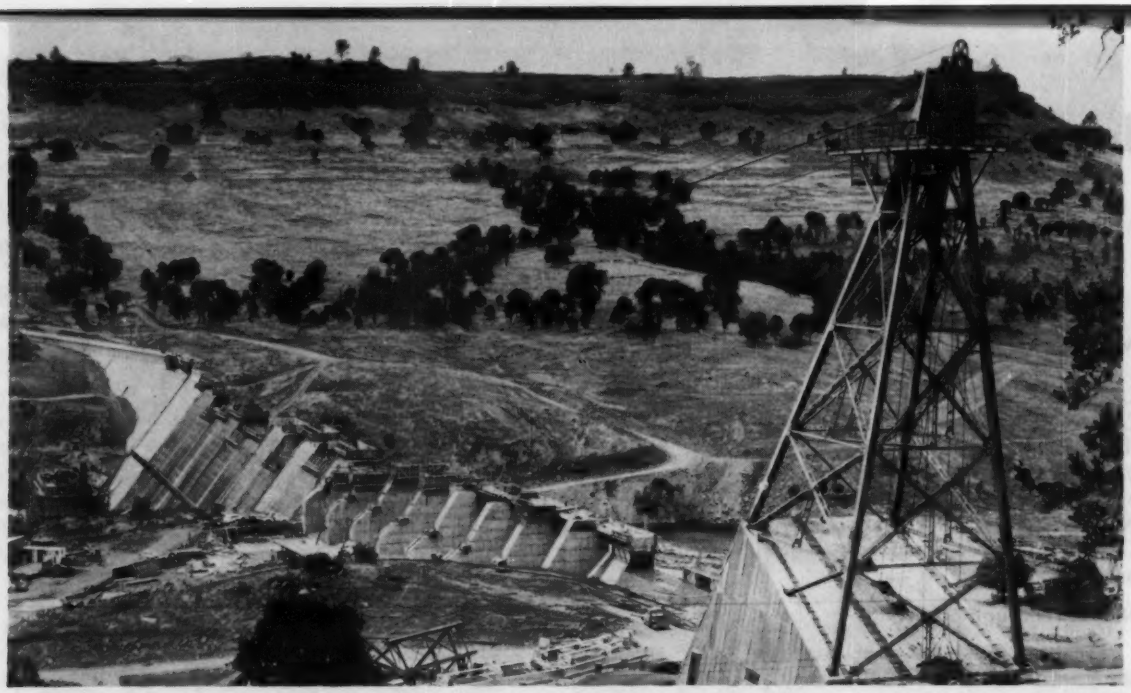
Outdoor-type construction would be used for the power plant. The units would be used as turbines during peak-day operations and as pumps during off-peak night operation.

An upper reservoir of 15,000 acre ft and a lower reservoir of 6,000 acre ft would provide the necessary storage capacity water. The upper reservoir would have a 40-ft drawdown to elevation 1,125 ft while the lower one would have a 20-ft drawdown to 736 ft.

This proposal is the result of pump-storage studies General Public Utilities Corp has made for its member companies.



TWO-RESERVOIR plan of NJP&L offers added Jersey City water storing capacity



TULLOCH DAM and powerhouse construction continues. Completion target of March, 1958, will be beaten by seven months. Donnells and Beardsley, other two units of Tri-Dam Project, are complete and operating on the Stanislaus River

Partnership scores again as Pacific G&E and two irrigation districts . . .

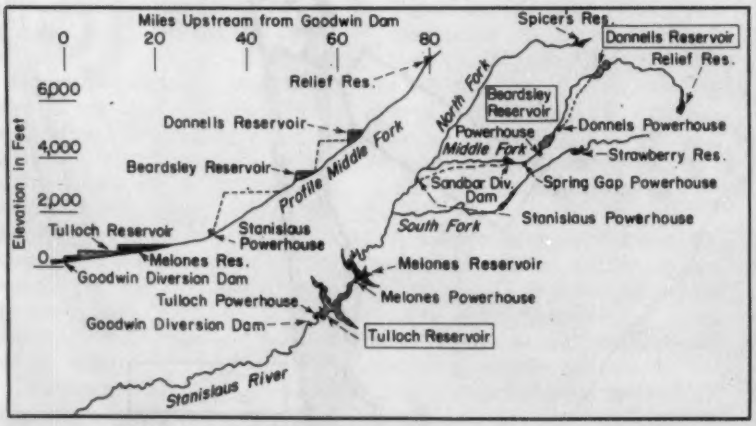
Put Tri-Dam Project in Service

Northern California's Tri-Dam Project, a $52-million testimonial to the workability of the partnership approach to dam-building, is nearing completion.

Two of the dams, Donnells and Beardsley, are finished. Tulloch Dam, some 45 mi down the Stanislaus River from Beardsley, is to be completed this month.

Beardsley power went on the line in May and Donnells went into operation a month later. The Tulloch generators are expected to be on the line by year's end.

To the Oakdale and South San Joaquin Irrigation Districts, who built the project, Tri-Dam represents 230,400 acre-ft of additional water storage capacity that will enable district members to irrigate during the entire growing season.



STORAGE PROVIDED by three new reservoirs not only will operate generation at new plants but will increase utilization of existing PG&E powerhouses at Stanislaus and Melones. All power will feed into PG&E grid for peaking

To Pacific Gas & Electric Co who will pay $115 million, over a period extending from now until the year 2005, for power generated by the falling water, it means power from three new district-owned power plants with combined installed capacity of 81 Mw, plus increased output from two existing PG&E plants aided by added storage.

Districts to Get More Water—Free

Because PG&E is a partner in the project, members of the two irrigation districts will get this increased water supply free of charge. Not only will PG&E's power payments pay the full cost of the project and bond interest, they also will cover maintenance and operation.

And the PG&E contract is sole security for the bond issue the districts sold to finance the project.

This is not the first such partnership venture for PG&E. The company buys power or the use of water for power generation from the East Bay Municipal Utility District, the federal government and six irrigation districts: Merced, Nevada, Table Mountain, Oakdale, South San Joaquin and Thermalito.

The Nevada Irrigation District agreement, which goes back to 1924, was the first such co-operative project. An early pact with the Oakdale-South San Joaquin districts led to construction of Melones Dam, which will be integrated with the Tri-Dam system.

Better known is a partnership arrangement that is still in the proposal stage—an offer by PG&E to build and operate power features of the federal government's $225 million Trinity River Project in Northern California. Other PG&E proposals have been made to the Oroville-Wyandotte Irrigation District for cooperation on a South Fork Feather River project and to the State of California for a power agreement covering Oroville Dam.

Integration an Asset

Such partnership ventures aid all concerned, PG&E points out, because by-product power from irrigation projects isn't easy to use economically unless integrated into a regional power system.

In the earlier contract under which the districts built Melones Dam and the company built the power plant, PG&E purchased the use of falling water. In the new agreement PG&E purchases power, taking delivery at the districts' Tri-Dam plants and transmitting over company lines into the integrated PG&E system, and also purchases use of falling water through its own plants.

The contract calls for two types of payments: a uniform semi-annual sum pegged high enough to pay off the bonds, and variable payment based on the project's operating and maintenance costs.

Water Pays Its Way at 5 Plants

Water from the Middle Fork of the Stanislaus will generate power at the Upper Works plants, Donnells and Beardsley. Next it's diverted through PG&E's Stanislaus powerhouse, an existing plant whose usage will be improved by Upper Works' storage. Now on the mainstream of the Stanislaus, the water is used at previously-built Melones. Finally it flows through Tulloch power plant. Downstream, it's regulated by Goodwin Dam, an existing structure raised to serve as Tulloch's afterbay.

Now the water is available for irrigation, having paid its fare to the irrigation ditch by working at five power plants along the way.

The Tri-Dam Project goes back to 1928, when studies were started. The project almost stopped when it reached the construction stage in 1953. First setback was upswing in interest rates, just after construction bids had been invited, that made it impossible to proceed.

To reduce the job to a size they could handle, the districts decided to build Tri-Dam in two steps—the two upper dams first (they represented 80% of the cost but 90% of the revenue) and Tulloch later.

Second bid call, this time for the Upper Works only, netted only one bid, too high to be accepted.

The third try was more successful, partly because the districts added $1 million to the amount available, and offered the contractor an early completion bonus. Any power income Upper Works earned before December, 1958, would go to the contractor. A similar bonus was offered later for Tulloch.

Successful bidder on the Upper Works was a joint venture—Tri-Dam Constructors, composed of Morrison-Knudsen Co, Macco Corp, Peter Kiewit Sons Co and Stolte, Inc—for $31.2 million.

The districts then decided to go ahead with Tulloch. Successful bidder on this project, at $8.3 million, was Arundel Corp and L. E. Dixon Co.

The bonds, secured by PG&E's guaranteed power payments, sold at a 3.05% rate.

Tri-Dam's Upper Works were completed a year and a half ahead of target date. Lower Works are about seven months ahead of schedule.

Tri-Dam Statistics

	Donnells	Beardsley	Tulloch
General			
Stream	Middle Fork Stanislaus R.	Middle Fork Stanislaus R.	Stanislaus R.
Available water	Average 300,000 acre-ft per yr	Average 400,000 acre-ft per yr	Average 1,000,000 acre-ft per yr
Drainage Area	224 sq mi	305 sq mi	987 sq mi
Reservoir			
Length	3 mi	3 mi	7 mi
Area Covered	425 acres	720 acres	1,260 acres
Max. Pool Elevation	4,916 ft	3,397 ft	510 ft
Storage	64,500 acre-ft	97,500 acre-ft	68,400 acre-ft
Tunnel Intake Elevation	4,702 ft	.....	.....
Low Level Outlet Elevation	4,670 ft	.....	.....
Dam			
Type	Concrete Arch	Earth Fill	Concrete Gravity
Total Length	960 ft	1,000 ft	1,600 ft
Height Above Streambed	290 ft	280 ft	165 ft
Max. Height	477 ft	320 ft	200 ft
Max. Thickness at Base	.....	1,200 ft	165 ft
Total Concrete in Dam	175,000 cu yd	.....	230,000 cu yd
Total Volume of Fill	.....	3,000,000 cu yd	.....
Arch Thickness	10 ft at crest 41 ft at base	.....	.....
Thickness at Crest	.....	.....	12 ft
Powerhouse			
Installed Capacity	1 unit 54 Mw	1 unit 10 Mw	2 8.5-Mw units
Max Static Head	1,481 ft	264 ft	149 ft
	Tunnel 38,000 ft long 12½-ft horseshoe, paved invert		
	Penstock 2,600-ft long 81-in.OD 1,200-ft drop to powerhouse Max thickness of steel: 1-13/16 in.	**Afterbay Dam** Timber, rock and gravel 250-ft long 35 ft ht above streambed 250 acre-ft storage 6-ft dia gate-control pipe outlet	**Goodwin Dam** Concrete arch (constructed 1916) Raise 7 ft, remodel intakes 500 acre-f storage

Critical Columbia Flow

Columbia River flows went into critical range in July, one month earlier than usual, according to Bonneville Power Administration's William A. Pearl. The Administrator blamed early runoff and comparitively light summer rainfall. Region-wide rains hold the key to fall power output, he said, as the U. S. system enters the annual low-water period. But all reservoirs are full and present light rains provide some improvement.

The federal hydro projects can carry 5,400-Mw peak during the coming drawdown. This is 10% over 1956 and is adequate to carry all firm contracts. Weather will determine necessity of curtailment to industrial interruptibles, now totalling about 475 Mw. Pearl noted that general regional rains can boost power resources up to 1,000 Mw within a week's period.

R/W With Reservations

Legal proceedings, which conceivably could affect rights-of-way acquisition across all U. S. Indian reservations, are developing in Idaho. The principals are Washington Water Power Co and Mrs. Julia Nicodemus, a 67-year-old, full-blood Coeur D'Alene Indian.

The utility recently began condemnation proceedings for high-voltage line R/W across Mrs. Nicodemus' 40-acre farm in the north central section of the state. She fought the suit all the way, basing her arguments on an 1887 treaty which, in effect, says the reservation land can't be sold or occupied without Indians' consent. But a Boise federal district judge ruled in favor of WWP, saying "Progress cannot be stifled or stopped by an agreement that is now obsolete."

Afterwards, Mrs. Nicodemus and her attorney said they will take the case to the Supreme Court if necessary in a battle "that could drag on for years."

Niagara Go-Ahead

Pres Eisenhower is expected to sign the Niagara bill within the week. The measure passed the Senate last Monday on a voice vote. The legislation ends a seven-year hassle over who should develop the resource.

The bill, passed without amendments, will allot 50% of the 1,800-Mw power output to preference customers. Of this, 20% is available to neighboring states. Niagara Mohawk Power Corp will receive 445 Mw. The company, in turn, will yield water rights to the New York Port Authority, which will build the $600-million project. Higher labor and material costs have boosted power production estimates of 2.08 mills per kwhr in 1951 to 4 mills/kwhr today.

The authority announced it had accepted a joint bid by Baldwin-Lima-Hamilton Corp and Newport News Shipbuilding & Drydock Co to supply 13 hydraulic turbines. Contract will be awarded Nov. 15 for the $20,415,600 worth of machines.

Rapid Amortization Finale

The Senate voted last week to limit rapid tax amortization to two categories—new military equipment and defense effort research and development. The program would end entirely in 1959 under provisions of the bill sponsored by Harry F. Byrd (D-Va.). It now goes to the House.

During seven years of the program, electric utility companies got 928 certificates which allowed an average of 48% for so-called "fast tax write-offs" on $6.7 billion spent for expansion. The over-all program found 21,749 certificates issued for expansions costing $37 billion through 1956.

Q: Are Hamil's Wings Clipped?

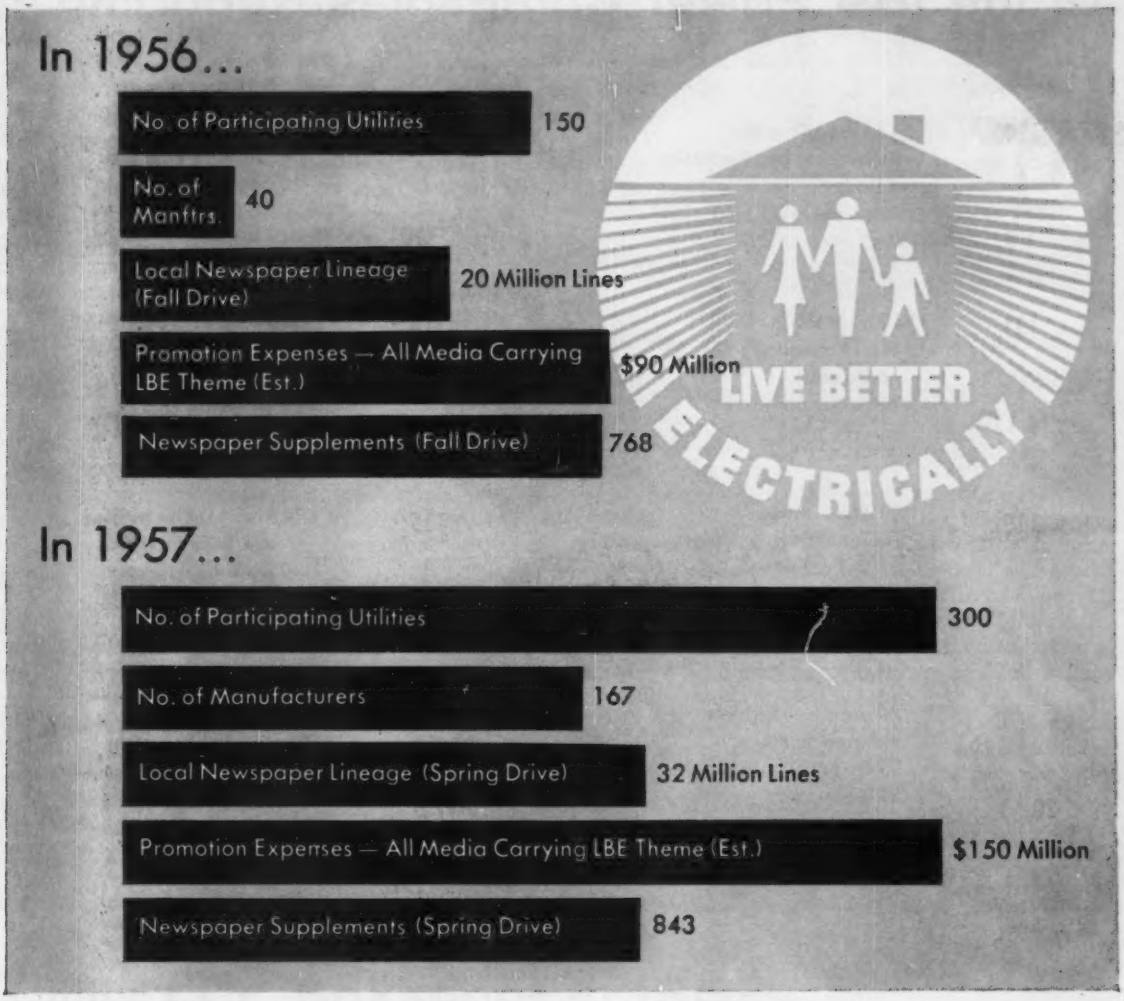
The Administration appears to be facing another brush fire on the power front. This time it involves the Rural Electrification Administration.

Root of the trouble apparently is the effort of Hoosier Electric Energy Co-op to obtain a $40-million G&T loan from REA. Congressional sources say REA Administrator David Hamil endorses the loan, despite Administration opposition. The same sources now claim the Administration has stripped Hamil of authority to approve such large loans.

Sen Hubert Humphrey (D-Minn.) recently has tried to get vacationing Agriculture Secretary Ezra Benson to appear for a hearing before his subcommittee on reorganization of government operations. Humphrey wants to grill him about reports that Hamil's wings have been clipped. Humphrey claims Benson ordered that loan applications above $500,000 must be approved by the Agriculture Dept rather than by Hamil. Specifically, loan applications go to the office of Kenneth L. Scott, director of Agricultural Credit Services Div.

Adding fuel to the fire in eyes of co-op supporters is the fact that Wesley D'Ewart has been named Scott's assistant and is reviewing the applications. D'Ewart, defeated in a 1954 Senate bid, was later named by Pres Eisenhower as assistant secretary of the Interior. But the Senate didn't confirm it.

Hamil refuses to comment although his office admits that such loan applications do go to Scott for "review," but not for approval.



Highlights from the Industry Report on

The 'Live Better . . . Electrically' Program

"Live Better . . . Electrically," the electrical industry's market development program, is rounding out its second year. Although originally spearheaded by the electric utilities, the program has mushroomed in many directions, and now includes practically all segments of the industry. However, power companies still appear to make up the largest bulk of its participants (300 utilities as opposed to the next participating group, the manufacturers, who stand at 167).

Interest in LBE's development has naturally run high. As with any promotion program, its proponents and developers wondered just how effective it was. To find out, Live Better Electrically headquarters conducted a survey of 159 utilities, representing some 40 million meters. Basic idea was to find out what the power companies thought of the program. Just how diversified is its theme? Which of the materials it supplies seem to be the most used and effective?

Of the 159 power companies, 62 are combination, 94 are straight electric, and three did not indicate. Of these, 74 merchandise appliances, 81 do not, and four did not say.

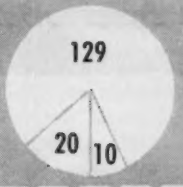
LBE Theme Gets a Good Workout

Use of the LBE theme among the 159 ran overwhelmingly high. Queried on their use of it in their advertising and promotion, 154 reported they did, only four did not, and one lone character gave no answer. In sales programs LBE also ran very high, but not quite so good as in advertising and promotion. 131 companies use it in their sales programs, 16 don't and 12 didn't say.

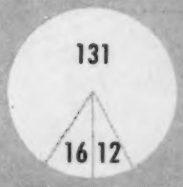
Asked whether their 1957 programs include both Live Better Electrically and HOUSEPOWER, answer-

Of the 159 Power Companies Reporting . . .

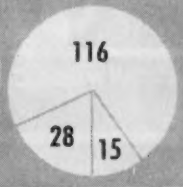
154 use LBE in their Advertising and Promotion
4 Do not
1 No report



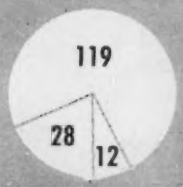
129 have Dealer Cooperative Programs
20 Do not
10 No report



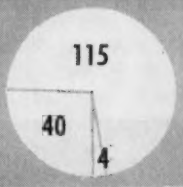
131 use LBE in Sales Promotion
16 Do not
12 No report



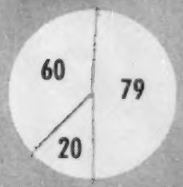
116 have active Electrical Contractor Programs
28 Do not
15 No report



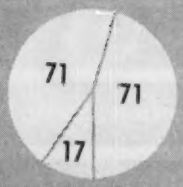
119 tied-in with National Electrical Week
28 Did not
12 No report



115 have active Builder Cooperative Programs
40 Do not
4 No report



60 have Cooperative Advertising Plans
79 Do not
20 No report



71 have LBE-Promoting Electrical Associations
71 Do not
17 No report

ing power companies racked up the following score:

- LBE alone—147
- HOUSEPOWER alone—143
- Both—138

LBE seems to have had only moderate success among electrical associations. Asked whether their particular electrical associations were promoting electrical living under the LBE banner, only 71 or 44% replied in the affirmative. The same number said no, and 17 failed to answer. Likewise, under the Housepower banner, the respective figures are 62, 80 and 17.

Newspapers are playing a big part in propagating the LBE message. About half the power companies (79) work with their local area papers to develop special Live Better Electrically sections and supplements. These 79 companies will pile up a total of 679 special sections in 1957. In '56, the total was 424, with no figure available on the number of companies involved. Altogether in 1957, in local company promotion, more than 7,500 newspapers in the U. S. will carry LBE sales messages of one kind or another.

Radio and TV are also carrying their share of the burden. Some 1,323 radio and 267 television stations are involved. Utilities seem to prefer the nationally filmed TV commercial, which points up a gap that will need filling in coming LBE national programs.

Direct mail apparently doesn't get much play. This seems logical in that LBE in an "institutional" program, and direct mail is used preponderantly with specific merchandise. It may indicate that utilities need to include the Live Better Electrically symbol more in their direct mail promotion pieces.

The county and state fair come in for their share of the glory. No less than 115 power companies reported that they use them to carry LBE. Total in the country: 883.

Home Service Is a Good Salesman

Home service departments are doing a good job of selling Live Better Electrically. Demonstrations featuring LBE are carried on regularly by 116 utilities. The demonstration is also a well accepted technique at the trade group meetings. . . .

Speaking of trade groups and trade allies, the survey indicates that utilities are not overlooking them in their Live Better Electrically activities.

Dealers—Asked whether they had an active dealer cooperation program, 129 utilities reported they had, 20 said they didn't, and 10 did not say. Those companies with such programs account for more than 43,000

cooperating dealers and 4,400 distributors. Companies who provide their dealers with LBE promotional aids number 111; 88 conduct sales training courses. Advertising-wise, some 60 utilities cooperate with their dealers, and 131 hold demonstrations in dealers' stores.

Builders—The new home and remodeling markets present an excellent opportunity to get in the LBE pitch. Utilities, apparently, realize this. Of the 159 queried, 115 have active builder cooperation programs. They employ more than 1,200 men who regularly contact upwards of 16,000 builders throughout the country. Ninety-nine power companies promote model homes; 75 have participated in "Parade of Homes" promotions, and 66 give their builders cooperative-advertising assistance.

Contractors—Survey reports indicate that the electrical contractor is certainly not being left out of the picture. Some 16,200 of them are under the LBE wings of 116 utilities. Fifty eight use the Housepower Forum, 93 use NWB promotion materials, and 94 also develop their own aids. But the utilities would like to see more LBE accent on wiring. Sixty-nine said they wanted to do this.

National Electrical Week Wedded to LBE

National Electrical Week and Live Better Electrically were wedded by a surprisingly large number of power companies, considering that N.E.W. was celebrated for the first time in '57. Almost 75% of the answering utilities, or 119, said they tied the two together. Ninety-seven did it in newspapers, 85 on radio and TV, 28 in sales programs, and 54 conducted N.E.W.-LBE special promotional contests on events.

What did the utilities think the Live Better Electrically program needed most?

More national television advertising topped the list (82 wanted this). National magazine advertising ran a poor second with only 44 saying they wanted to see more of it. Then the list of things wanted closes up, with the score as follows:

- TV spots on EEI's promotion calendar (43)
- Newspaper ad mats for local use (39)
- Artwork for local ads (39)
- Recorded radio commercials (39)
- LBE loan exhibits (39)
- Newspaper supplementary editorial material for local use (37)
- LBE consumer motion pictures (33)
- Publicity kits on electrical living (30)
- Trade ally promotion kits (26)
- LBE billboards and car cards (23)
- Direct mail items and envelope stuffers (15)

This, then is a picture of what has been happening in the Live Better Electrically program since its inception in February, 1956. Specific quantities in a general program such as LBE are difficult to measure, but trends can be traced. These trends seem to indicate that Live Better Electrically has gained wide industry acceptance—among utilities, manufacturers and associations and others.

The forthcoming industry report should indicate where the program needs changing to make its success as big and as sure as it has been in the past two years.

(Report continued on following page)

Utility LBE Boxscore in 1957...

7,535 Newspapers will carry LBE messages

4,421 Billboards will give an LBE effect to landscape

267 Television stations will give viewers LBE pitch

1,323 Radio stations will add their voices to LBE chorus

18,021 Car cards will remind riders of electrical living

47 Utilities will use other media (films, kinescopes) to sell LBE

Progress Report Leaves No Doubt That

Manufacturers Are Pushing LBE, Too . . .

No small amount of the credit for Live Better Electrically's success must go to the manufacturers who have so solidly backed the program.

At the end of 1956 the number of participating manufacturers totalled about 40. Today, with a third of 1957 still to go, the number stands at a whopping 167. This is an increase of almost 320%!

This big jump in manufacturer support was largely the result of a planned program of contacting important electrical manufacturing company executives. This contact program was sparked by Edison Electric Institute, through various utility executives, and Live Better Electrically's regional managers.

Industrial Manufacturers Do Their Bit

Support is coming from industrial as well as consumer-goods manufacturers. This is unusual insofar as LBE is a residential market development program. Generally the support takes the form of Live Better Electrically sales messages in advertising and promotion. Occasionally, manufacturers, in their newspaper ads and television commercials, will have their product message take a second place to the LBE message, or they will eliminate it altogether, giving Live Better Electrically full billing.

Although the big consumer manufacturers, such as Kelvinator, Frigidaire, Philco, Westinghouse, General Electric and others, have been beating the drums for LBE in such varied activities as their consumer magazine and trade magazine ads, dealer point-of-sale aids, network TV commercials, instruction booklets and special bulletins to distributors and dealers, manufacturers' support is by no means limited to them. The smaller boys are playing second fiddle to no one. Lightolier, Wakefield Co, in lighting, and Landers, Frary & Clark, and other housewares manufacturers keep hitting away at LBE. Many use it in new promotion pieces and descriptive brochures. Trade shows and exhibits are a favorite medium. Witness the recent Housewares Show in Atlantic City, where no less than 28 manufacturers gave LBE space in their booths.

In connection with trade fairs and shows, mention must be made of the Live Better Electrically Caravan. The caravan, sponsored by GE, is now on the road, touring state fairs and exhibits in some 16 states. No less than three million people will have gone through its four trailer-exhibits by the end of 1957.

Manufacturers have found the diversity of the LBE theme easy to work with. It can be tied-in tc their messages in a host of ways, even when the sales pitch is not consumer-directed. This helps explain why non-consumer manufacturers, such as Anaconda Wire & Cable, I-T-E Circuit Breaker, Simplex Wire & Cable, Ohio Brass Co—just to mention a few—have used it.

Additional manufacturer support is coming in a steady stream into LBE's New York headquarters. There is every reason to believe that Live Better Electrically, as it heads into its third year, will be getting the increasing manufacturer support upon which its continued success rests so heavily.

. . . and Associations also are no Slouches

Industry associations also are doing their share in pulling the Live Better Electrically load. Almost without exception they have lent their warm and generous support to what they regard as the electrical industry's all-inclusive residential market development program.

Although most associations climbed aboard Live Better Electrically's bandwagon early in 1956, it took awhile for the program's theme to be worked into the particular programs of the associations themselves. That process is now complete, and LBE has been pretty thoroughly integrated into association promotional activities.

For example—

Edison Electric Institute's 1957 Coordinated New Home Campaign Materials contained a separate kit of supplementary promotional material prepared by LBE's people. EEI's kit is made up of 28 pieces, built around lighting, appliances, switches, outlets and Housepower. Virtually all of them contain the Live Better Electrically symbol or slogan.

National Electrical Manufacturers Association has also adopted LBE in its promotion. In a new full-color, sound-slide film by NEMA's House Heating Equipment Section entitled, "Heat Your Home Electrically," the Live Better Electrically theme is completely worked into the story of electric heat's advantages. Even the title is a variation on the LBE theme.

National Electrical Contractors Association has lent powerful support to the Live Better Electrically program since its inception. It has regularly posted its members on LBE developments through its magazine, Qualified Contractor, and encourages its members to tie-in with LBE promotions on the local level.

American Public Power Association acts as a constant Live Better Electrically information pipeline to its some 700 members in 39 states, culminating in such outstanding promotion as the Spring Push mounted by Power Board of Chattanooga and others. APPA's recent annual meeting in New York featured LBE in several major speeches and in the showing of "Meet Mrs. Swenson," the Live Better Electrically film presentation.

Installed in ladder racks . . .

and easily worked . . .

Aluminum Armored Cable Saves

INDUSTRIAL
Distribution

Trims material and labor outlays for 550-v and 6.6-kv lines in distribution system of expanded paper mill

Aluminum armored cables in aluminum ladder-type racks are features of the supply system at the recently expanded International Falls mill of Minnesota & Ontario Paper Co. These cables and racks were installed for 6.6-kv primary and 2.4-kv and the larger 550-v secondary distribution.

Use of aluminum cables and racks, instead of leaded cable in conduit, brought significant savings in cable and labor costs. The new installation has better corrosion resistance and improved accessibility for maintenance and repair. Bends in this installation are easier to handle, and the cable-and-rack combination provides for future expansion.

Armored cables cost 8 to 17% less than leaded cable, the higher saving applying to the larger copper sizes. A short run of a single leaded cable in conduit has a lower labor cost than a comparable rack installation. Armored cable and rack, however, cost less when the cable run is longer and has many bends.

Armored cable and rack eliminate cable splices and pull boxes. Savings increase when several cables are installed in a single rack, the cost of a rack being only slightly greater than that of a single conduit. Although each leaded cable requires its own conduit, cables per rack can vary from two to six. Moreover, in several places it was economical to install racks wide enough for future cable runs.

Light Weight Cuts Labor

Additional labor savings were obtained because the aluminum armored cable is lighter and easier to handle than leaded or other armored cables. Flexibility simplified installation where the cable left the rack and was formed into bends impossible with leaded cable. In a continuous process industry, ease of repair and brief downtime through accessibility for repairs are important. Use of steel armored cable was prohibited by the mill's corrosive atmosphere. Aluminum armor is highly resistant to this atmosphere and costs less than other non-magnetic armored cable.

Special fittings were designed to terminate the armored cable. To protect against moisture, 6.6-kv feeders were terminated in potheads. A flanged terminator with an armor clamp and a Neoprene bushing that compressed against the cable jacket was used where a wiping-sleeve type flange would have been required for leaded cable. This technique cut installation time and produced a neater job.

Another innovation minimized problems experienced with overhead-line pothead terminations, both in vertical cable risers and at entrances through building roofs. An oversize conduit was installed through the roof to the height of the pot head. A flanged, cable-ventilating cable-support fitting, attached to the pothead, preserves the "in air" rating of the cable. The Neoprene compression bushing clamps so that it supports the entire weight of the vertical riser.

The conduit and fitting together

CONTROL CABLE BASKET running from substation to boiler house uses the same suspension hardware as the two racks above. Secondary feeder cables at substation drop vertically from overhead rack, have flanged-type fitting

support the pothead, only minor bracing being required to keep it from swaying. By using conduit, a water-tight seal was obtained at the roof. The cable can be pulled out, without re-opening the roof.

Flanged-type fittings, similar to those used at potheads, terminate secondary feeder cables at the substation units. The cable extends vertically from the overhead rack to the switchgear roof where the jacket is compressed in the fitting bushing and the armor is clamped. Here the cable was opened and the single conductors were extended to the circuit breaker lugs.

Similar fittings, in which locknut and insulating bushing replaced the flange, were set up at the motor boxes. A packaged terminating kit was used in connecting to the motor leads. The kit contained insulating tapes, lugs, and fittings.

Where cost and space precluded the use of a pothead on one application, a compound-filled terminator was installed. This fitting, larger than the others, has sealing rings at the locknut and bushing end.

Racks were carefully selected. The type chosen was available in a complete line of racks, fittings, and supporting accessories. In aluminum, it offered the corrosion resistance desired. Moreover, fewer supporting brackets and hangers were needed by the light aluminum racks and fittings. Fewer installation crews were involved. The nonmagnetic characteristics of aluminum afforded another advantage, while the aluminum racks function as a complete circuit for ground return.

Racks were fabricated of 3-in. side channels with formed rungs on 18-in. centers. They were purchased in standard 24-ft lengths. Special lengths were cut and fitted in the field to accommodate the number of bends and offsets required. Standard suspension parts were employed throughout.

Cantilever type brackets were used for runs along walls. Where runs were made below building floors or ceilings, beam clamps with hanger rods were installed. Fittings and mounting hardware were designed to be used together to assure a good fit and shorten erection time.

Trough Used for Single Runs

Racks range from 9 to 20 in. in width, depending on the number of cables carried. Bend radii for both vertical and horizontal bends were 24 or 32 in. depending on cable size and desired routing.

Aluminum split-strap type cable clamps fastened the cables to the rack. Rack rungs were slotted to accept the notched ends of the two clamp halves. It was then easy to draw the clamp halves together with a nut and bolt.

Where single cables left the rack for runs to individual motors, and for vertical risers from the substation to the overhead rack, 3-in. cable troughs were the cable supports. These aluminum troughs resemble a structural channel with punched openings in the bottom to allow air circulation. Flexibility was practically unlimited. Aluminum banding strapped the cable in the trough.

Cable was carried overhead in racks from the substation building to the boiler auxiliaries location. This was accomplished with a channel-beam cable rack bridge, designed specifically for the anticipated ultimate cable loading. The double width bridge allowed for future cable runs for a second high-pressure boiler in the planning stage.

A typical run averaged approximately 300 ft and contained the equivalent of seven 90-deg bends. Thus the flexibility of armored cable on racks has a decided advantage over leaded cable in conduit.

Due to the number of bends in each run, the quantity of relatively

short pulls, the rigging time for setting up and removing the conventional rollers and pulleys for installing cable and the possible pulling friction to be encountered, this method of pulling cables was abandoned for the overhead bridge job. Instead, as each rack run was completed, the cable reels were set up and made ready for pulling. On the following morning, yard laborers, under the direction of the electrical department were stationed at each bend of the run. A conventional pulling basket which was tied through the conductor to prevent stripping the armor was used. As the cable passed each bend, it was formed and directed by the men at that point. The spacing of the rack rungs and the curved surfaces presented by the cable armor offered a highly efficient pulling surface, not unlike a ballbearing effect.

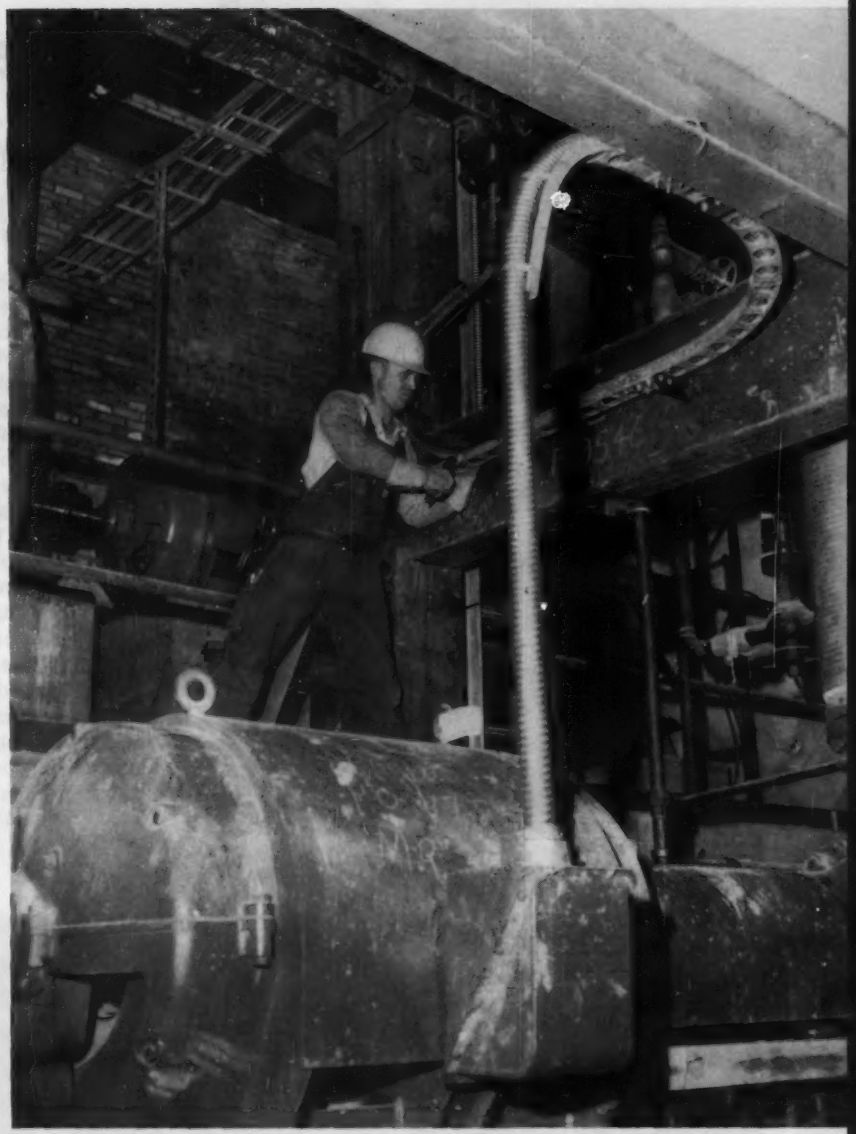
Reduce Installation Time

The surprising ease of pulling greatly reduced installation time. On one 275-ft run, four cables were pulled into place in less than an hour. Most time was consumed in changing reels. Upon completion of the pulling operation, clamping of the cables to the rack was carried out by electrical crews.

On horizontal runs the cable was clamped at every fourth rung. At bends and on vertical risers, clamps were placed at every rung to present a neat appearing job and give vertical holding support. Cables were spaced on the rack to give no less than 1-in. air space between them.

Between the substation building and the boiler house, a control cable basket was run in conjunction with cable rack. The rack suspension hardware provided a common support for the rack and basket. This was made possible through the standardization of fittings and hardware offered for the rack and basket.

This system was installed as part of the complete electrical facilities modernization program which included new switchgear for the hydro station and a new topping turbine. Separate cost figures are not available for the distribution facilities alone. However, in comparison with previous conduit installations, the man-hours consumed bears out the anticipated savings in installation cost.



SINGLE RUNS TO MOTORS have 3-inch trough with ventilated bottom. Termination uses locknut and insulated bushing instead of flanged fitting

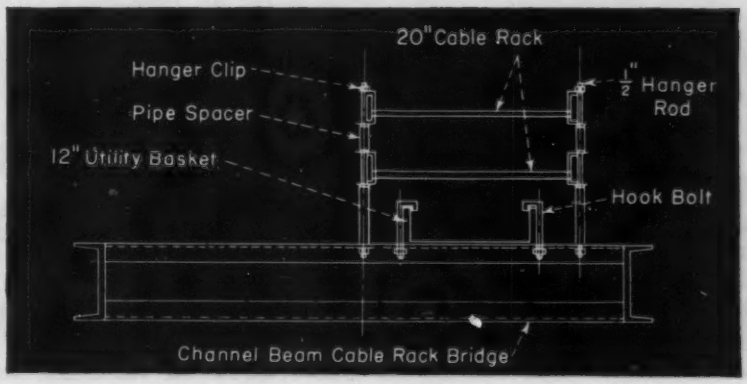
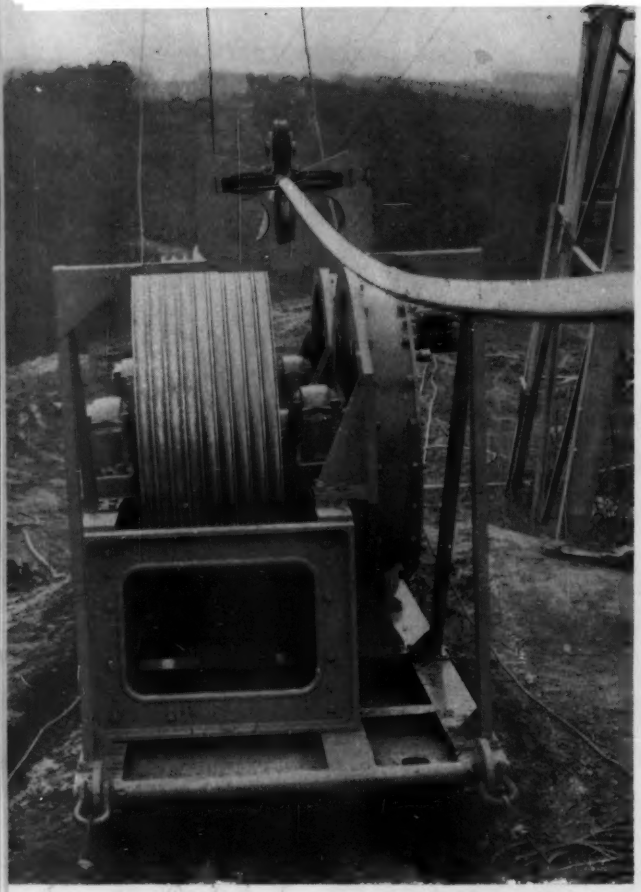


FIG 1—Diagram shows details of the channel-beam cable rack bridge used to carry ladder rack and basket from substation to boiler house



Appalachian Strings

Safety assured by grounding pulling cable, conductors and tension-stringing equipment

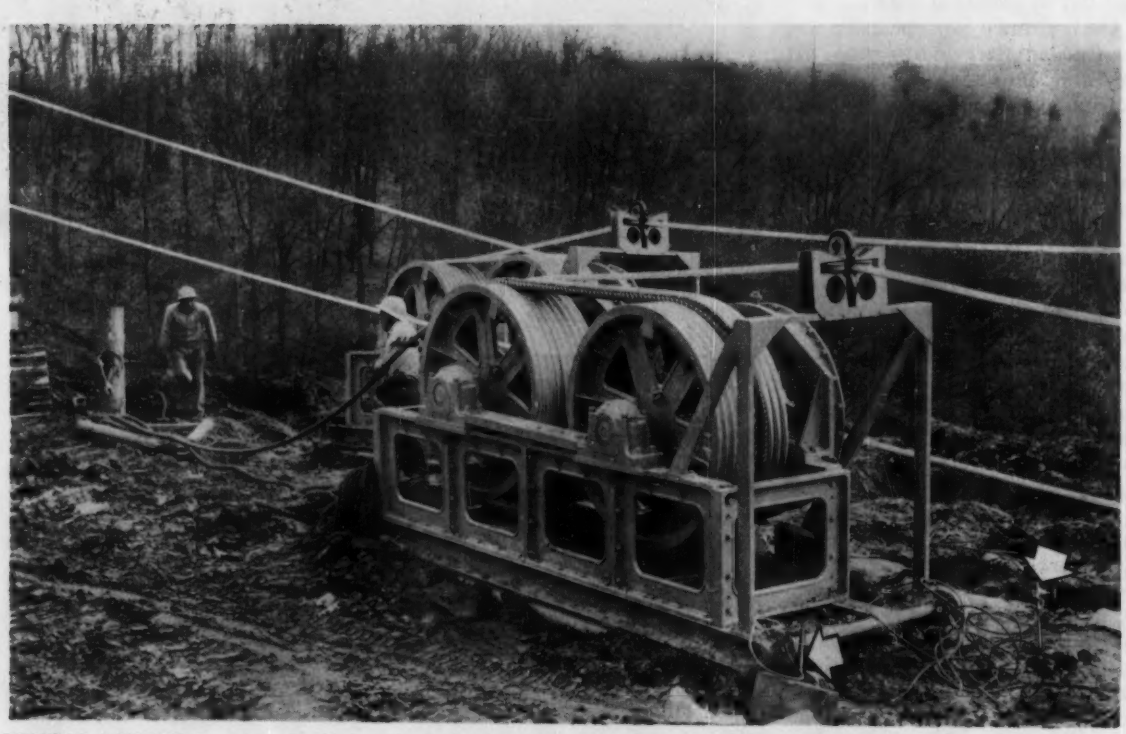
W. P. CARTER, System Transmission Line Superintendent, Appalachian Electric Power Co, Bluefield, W. Va.

Appalachian Electric Power Co recently installed a second 345-kv circuit on towers already carrying a live 345-kv circuit of the 62-mile Sporn-Kanawha line. Through careful plans and precautions, this feat was accomplished without injury to anyone.

It was undesirable to de-energize the existing circuit during tension-stringing of the 1¾-in. ACSR expanded conductors. However, it was realized initially that about 3 miles of cable between reel setups and pulling equipment would be exposed to induction from the adjacent live circuit. Thus there was the possibility that workers, other persons, or livestock might come in contact with the pulling cable or trailing conductors bearing induced voltages.

In general, safety was assured by grounding the pulling cables and conductors through the sagging blocks at all suspension points. In addition, the pulling and braking equipment was grounded, and conductor grounding facilities were provided where splices and deadends were made.

After all grounds had been made in the first pulling



BRAKING EQUIPMENT was grounded with ⅝-in. by 7-ft ground rods (arrows) driven to maximum of 6 ft to protect workers from induced voltages. Large rope on the machine was used initially to lead the conductor around the drums

Line on Towers with Live 345 Kv

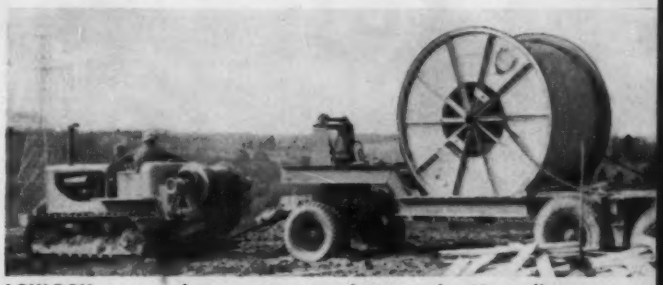
section, mid-span voltage readings at several points showed that the induced voltage was less than 1 v even in the longer spans.

To ground the pulling cables and conductors at each suspension point, the insulator assemblies were temporarily short-circuited by jumpers from the tower crossarms to the sagging blocks attached to the bottom of the insulator strings.

To ground the pulling and braking equipment and the conductors at splicing points, several ⅝-in. by 7-ft ground rods were driven to a maximum depth of 6 ft. Splicers and deadend assemblers were protected by similar ground connections to the conductors about 20 to 30 ft from the working area. This scheme gave adequate flexibility in handling the cable ends.

Special liners made of tough durable conducting materials provided a grounding connection between each sagging block and its sheave. These liners protect the sheaves against abrasion by the steel pulling cables but automatically drop to the ground after the cables pass. This action leaves a smooth surface in the grooves as insurance against damage of the trailing aluminum conductor strands.

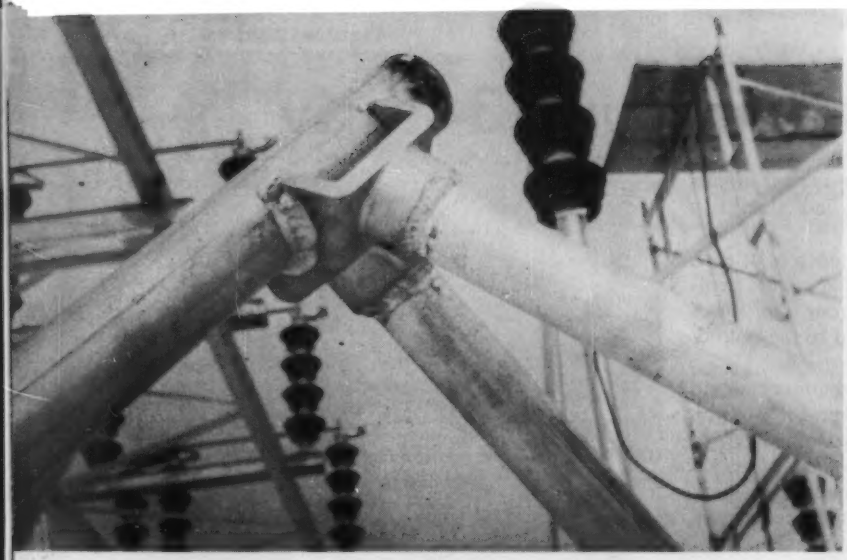
Latch couplings in each end of the liner held it in the sheave until the ¾-in. stringing cable was pulled through. The trailing conductor, being of larger diameter, then tripped the latch holding the liner, permitting it to fall to the ground.



LOW-BOY was used to transport conductor reels. Normally the conductor was pulled from its position on the low-boy

HYDRAULIC MOTOR synchronized reel and pulling machine. It was driven by oil pressure from motor on pulling machine

PULLING EQUIPMENT was also grounded, and pulling cables and conductors were grounded through sagging blocks at all suspension points. Notice the permanent sleds mounted on the stringing equipment for use in mountainous terrain



Prefabricated

Components in new standardized transmission substation design of Utah Power & Light Co reduce erection time and construction costs

RALPH A. RADFORD, Asst Chief Engineer, Utah Power & Light Co, Salt Lake City, Utah

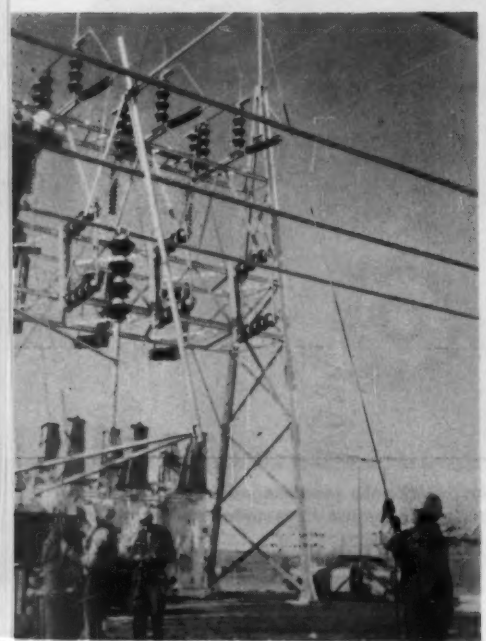
Welded aluminum tubing bus and prefabricated fittings are cost-cutting components of a new standardized transmission substation design by Utah Power & Light Co. Rigid aluminum tubing bus replaces copper tension bus in previous designs, permitting closer clearances. Prefabricated weld fittings reduce erection costs and construction time. Standardizing on this design will reduce design and drafting costs and hours for future substations. Riverdale Substation, the first unit incorporating the new design, recently was energized.

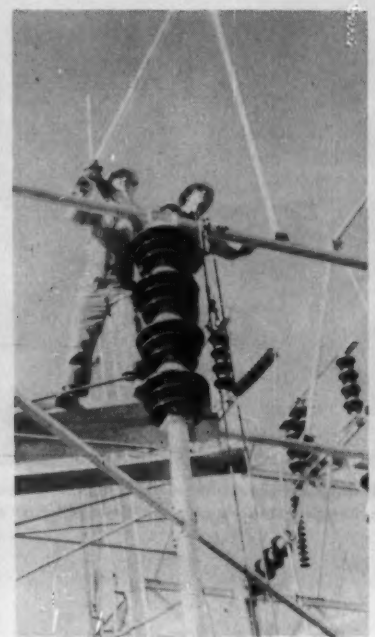
Utah P&L started standardizing transmission substations in 1951. With the increasing tempo of installations required during 1951-1952, it was apparent that design time must be reduced. The luxury of an individual design per substation could no longer be afforded. Moreover, older arrangements were not sufficiently flexible for UP&L's changing requirements. The company's engineers standardized on a double-bus substation for 138 and 161 kv, and on an operating and transfer-bus substation for 46 and 69 kv (see diagram).

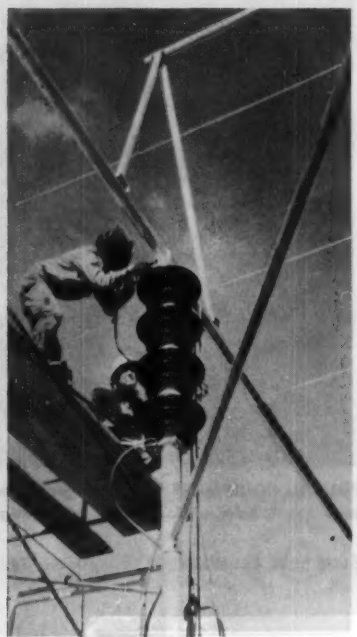
At first, these designs utilized tension buses with flying jumpers from buses to air-break bus-selector switches. This proved satisfactory both electrically and structurally. More recently, UP&L engineers felt a structural cost saving could be effected by using the closer clearances permitted by a more rigid tubing bus construction. They also redesigned the footing arrangement of the center take-off structure to provide mounting space for bus selector switches. While reviewing the proposed design changes, they were attracted by new aluminum welding techniques which would allow field fabrication of buses by welding.

Field welding by the tungsten inert-gas process (heli-arc, utilizing argon shielding) gave promise of re-

Ground-built A-frame is raised, set precisely, and welded quickly and economically







Weld Fittings Join Aluminum Bus

duced erection costs and simplified handling and procurement. Minimum resistance connections on buses, taps, and supports seemed assured.

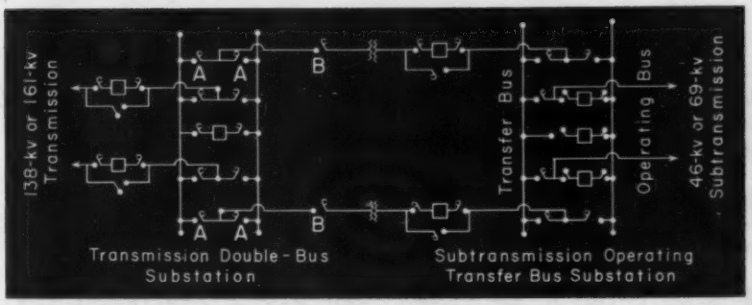
Available literature indicated, however, that users of the welded-bus construction were field-fabricating the weld fittings. UP&L did not want a design requiring critical field fitting, jigs, or welding, nor did it want to field-fabricate fittings. Engineers requested a fitting manufacturer to supply a line of weld fittings which would require only a square cut of the tubing to make up buses and jumpers. The result was a complete line of simple fittings, cast from high-strength, high-conductivity aluminum alloy which retains its physical properties after being brought up to weld temperature.

Riverdale station, rated 138 to 4.6 kv, 100 Mva, was the first constructed in this manner. Only five weld fittings were used: Saddle at the base of A-frame jumpers; apex fitting; bus support; chill ring at main bus joints; and two sizes of corona bell.

At Riverdale, a 20-ton mobile crane was used extensively for steel and bus erection and as an aerial working platform. A-frame jumpers were shop-assembled adjacent to the substation area and raised into position by hand line. Tubular scaffolding, mounted on a flatbed truck, was used as a platform.

Having settled on simple standardized substations such as Riverdale. UP&L has greatly reduced design and drafting time to produce complete and finished sets of construction prints. For structural detail drawings, it is necessary only to make transparencies from the master tracing and fill in title and required quantities. Minor modifications are required only occasionally. Also, steel orders for standardized structures can be placed concurrently with major equipment procurement, a very desirable timing arrangement.

Satisfaction with the new design is evidenced by the current construction of Riverside Substation, the second station to utilize the standardized design and welded aluminum bus.



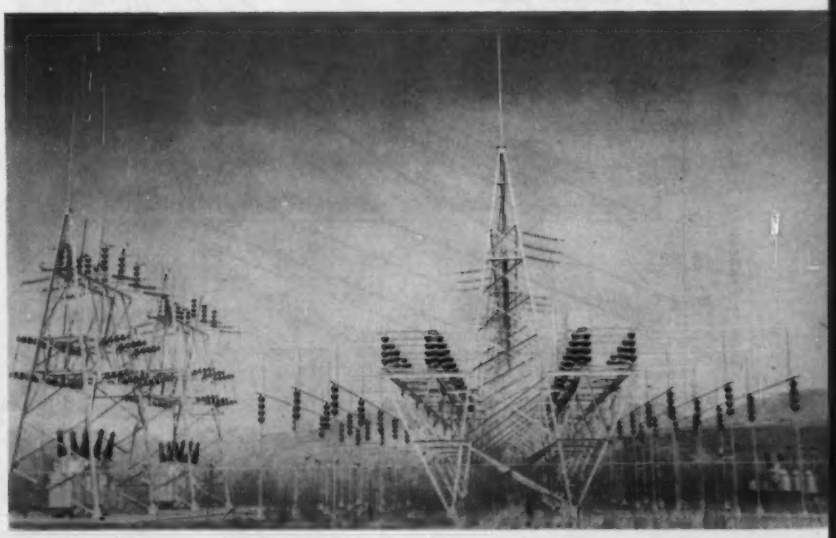
UP&L standardized on this basic scheme for 138-69-kv and 138-46-kv substations. Load-break switch at A eliminates structure and air-break switch at point B

Tension and Rigid Buses are Compared

	Tension Bus Design	Welded Aluminum Tubing Design
Width of bay		
161 kv	44 ft	.....
138 kv	36 ft	33–1/3 ft
69 kv	24 ft	25 ft
46 kv	22 ft	25 ft
Main bus	1000 MCM copper	3½-in. alum. tubing
Jumper connections	1000 MCM, 500 MCM, 250 MCM as required	2-in. tubing with 1½ in. legs
Steel required*	87,600 lb	86,850 lb
Concrete*	127 cu yd	55 cu yd
Cable, tubing fittings, etc*	$6,085	$6,435
Average welding cost per fitting	.....	$10**

*Material for electrically identical five-bay structures

**For the second installation, Riverside Substation, this cost was reduced to an average of $6.50 per fitting



RIVERDALE is first standardized substation to use rigid aluminum bus. Center take-off structure on spread footings provides space for bus selector switches

Coordinate Generator Prewarming

C. B. SCHARP, Engineer, Power Production Stations, Baltimore Gas & Electric Co, Baltimore, Md.

Sufficiently accurate guides for the safe prewarming of large generator rotors have been developed from a theoretical analysis of transient heat flow and temperature distribution in a large unit. Primary objective of this analysis by Baltimore Gas & Electric Co was the integration of the prewarming operation with turbine-starting procedures so that both could be applied and completed simultaneously. Field tests substantiated the accuracy of the analysis and showed that the primary objective is attainable.

Development of this heat flow and temperature distribution analysis is part of Baltimore G&E's continuing study of the best approach to rotor prewarming. Since 1948 the company has prewarmed large 3,600-rpm rotors before bringing them up to speed. Procedures were established to produce a temperature gradient between the coils and the rotor at a low enough speed so that coils could expand longitudinally before centrifugal forces locked the conductors in place. Prewarming was in conjunction with 2-hr turbine startups regardless of the length of shutdown.

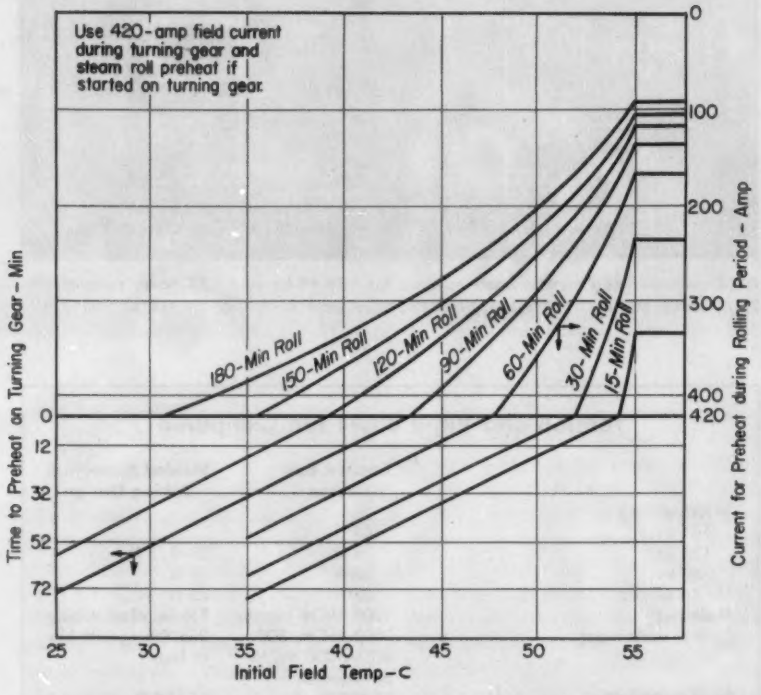


FIG 1—FIELD PREWARMING curves for a 60-Mw preferred standard generator provides the operating engineer with information for safe prewarming

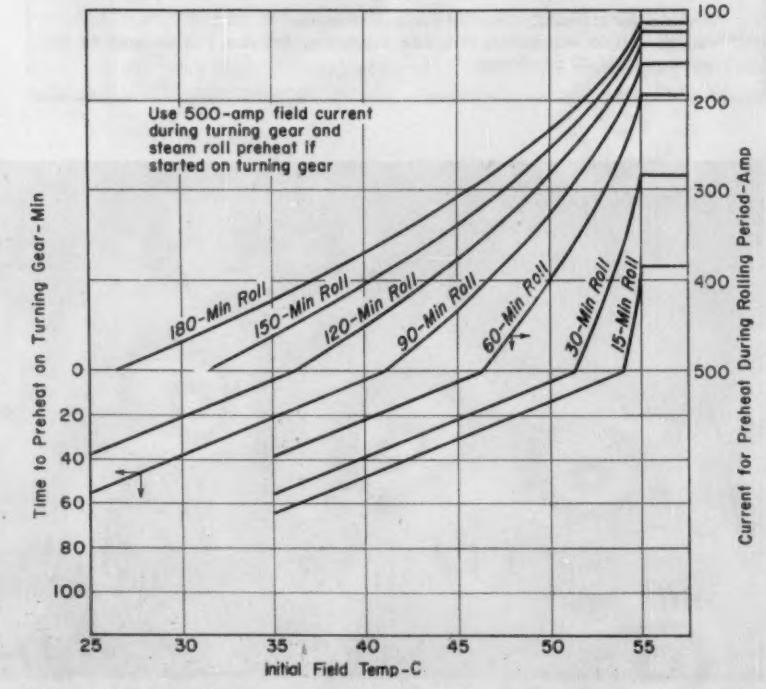


FIG 2—PREWARMING CURVES change as the rotor weight changes, as shown by a comparison of these curves for a 112.5-Mva unit with those of Fig 1

Turbine Temperature Rules

It became economically desirable in 1952 to shut down some older 3,600-rpm, high-pressure and temperature units nightly and over weekends. Procedures for turbine starting were established by tests in which the starting period was based upon critical turbine-metal temperatures. In the general case, when the controlling turbine casing metal temperatures have not dropped below 500F following a shutdown, the procedure is to start the turbine in 15 to 25 min. When the controlling temperatures have fallen below 500F, the procedures involve a gradual warming of the turbine before and during the steam-rolling period. These procedures are being refined.

When these procedures proved successful, it seemed logical that

with Controlled Turbine Starting

rotor prewarming should be coordinated chronologically with turbine starting to provide for protection of both ends of the unit during startup. Thus, curves based upon the distribution of heat generated by the field coils were developed. These facilitate the application of both procedures simultaneously. All units prewarmed by Baltimore G&E are equipped with separate motor-driven exciters.

Assume Steady State

The analysis behind these curves is based upon assumptions which reduce the problem to one of heat storage in the steady state. This is, of course, not a true representation of transient conditions during prewarming operations. The resulting values are rough approximations. Nevertheless, the assumptions allow a useful analysis, whose validity may be checked by field tests.

In prewarming generator rotors by applying dc to the field coils, advantage is taken of the difference between the thermal constants of the field-coil and rotor-forging materiels. These constants are measures of heat-storage capacity and resistance to heat flow. Their relative influences on the coil and forging heating rates are modified by the physical dimensions of the rotor and the flow rate of the cooling gas.

Flow rate of cooling gas in a self-cooled generator field is directly proportional to its speed. Heat generated by the field coils equals the sum of the amount absorbed by the windings and rotor forging and that removed by the gas circulated while the unit is brought up to speed.

It is not practicable at present to measure directly the rotor steel temperature on a routine basis. Direct measurment of the rotor bore temperature of one unit using thermistors is under investigation. This program has provided valuable information and is expected to yield more. The author's opinion is that the program will allow refinement of the prewarming procedure now used.

Rotor Temperature Unknown

In this analysis of heat flow and temperature distribution the rotor steel temperature is considered as unknown. Hence, the differential temperature, or the difference between the coil and forging temperatures, is unknown. To facilitate the analysis, these values were assumed: (1) the differential temperature, (2) the average speed during two parts of the rolling period, (3) a percentage distribution of rotor weight between coils and forging (if unknown) and (4) zero temperature gradients in the forging or windings at any given time. With these assumptions, the required heat absorption for a given initial rotor temperature can be determined by fixing either the time or the current.

Total amount of heat (in Btu) generated in the field windings by dc during the prewarming period, is given by equation (1). Some of this heat raises the temperature of the field windings and rotor forging, some is radiated to the stator, and some is removed by the circulating gas. A part of the latter amount goes toward raising the temperature of the stator cores and windings. The remaining part goes toward raising the temperature of the cooling water. This distribution is shown symbolically in equation (2).

In this analysis the amount of heat q_e generated in the stator core by eddy currents induced by the rotating field is assumed to remain in the stator. The heat absorbed by the circulating gas usually is less than 1% of the heat generated in the field windings. The heat transferred by radiation from the rotor to the stator is less than 3% at the highest temperature difference expected. These two amounts were, therefore, neglected in the subsequent analysis.

Represents Heat Removed

Because field prewarming requires no cooling water flow until the cold gas temperature reaches 55 to 60C, the only effect of the term q_w is to reduce the heat available to raise the stator tempera-

Equations Developed to Find Field Current and Duration of Prewarming Period

(1) $Q_{in} = 3.413\, I^2 R \theta$

where,

I is total current (amps)
R is equivalent resistance of the windings (ohms)
θ is duration of the period (hr)

(2) $Q_{in} + q_e = q_{Cu} + q_{Fe} + q_{H_2} + (q_{st} + q_w) + q_e$

where, in Btu,

q_{Cu} is heat absorbed by field coils
q_{Fe} is heat absorbed by rotor forging
q_{H_2} is heat absorbed by circulating gas
q_{st} is heat transferred to stator cores and windings by radiation and convection
q_e is heat absorbed in stator core by eddy currents induced by rotating field
q_w is heat absorbed by cooling water

(3) $q_{Cu} = (WC_p)_{Cu}(t_3 - t_1)$

(4) $q_{Fe} = (WC_p)_{Fe}(t_2 - t_1)$

where,

WC_p is the weight—specific heat product for copper coils or steel forging (Btu/C)
t_3 is final coil temperature (C)
t_2 is final forging temperature (C)
t_1 is initial field temperature (C)

(5) $$I = \sqrt{\frac{1.714(WC_p)_{Cu}(t_3 - t_1) + (WC_p)_{Fe}(t_2 - t_1)}{3.413\, R\, \theta}}$$

(6) $$\theta = \frac{(WC_p)_{Cu}(t_3 - t_1) + (WC_p)_{Fe}(t_4 - t_1)}{3.413\, (I^2 R)}$$

where, in C,

t_4 is temperature of field coils and t_4 is temperature of rotor forging at the end of turning-gear period

ture. The part of equation (2) in parenthesis then represents the heat removed by the circulating gas and is proportional to rotor speed and temperatures. The stator receives much of its heat from the eddy current losses which occur in the cores at high rotative speeds.

Heat capacities of the field coils and rotor forging are given by equations (3) and (4). The prewarming period was made the same as the steam-rolling period for the turbine. Substituting equations (1), (3), and (4) in equation (2), assuming average rotor speeds of 900 rpm for the first two-thirds and 2,700 rpm for the last third of the period, and expressing $(q_{st} + q_w)$ as a function of q_{Cu} and q_{Fe}, equation (5) was developed.

All Terms Known

This equation can be used to calculate the current, I, because all terms on the right-hand side are known. Temperature t_1 is the average of readings taken with the stator RTD's prior to the prewarming operation. It is assumed that the stator, field coils, and rotor forging are at the same temperature. The unit must have been shut down several hours for this assumption to be satisfactory. Temperature t_1 also can be found by passing a small current through the field windings and measuring their resistance. Temperature t_2 can be taken at 55, 60, or 65C, depending upon the final rotor forging temperature desired. The temperature difference $(t_3 - t_2)$ is the assumed differential.

One of the company's 60-Mw preferred standard generators was chosen to test the accuracy of this analysis. The final rotor forging temperature, t_2, to be reached was set at 55C. Plots of the current calculated from equation (5) were made against the initial field temperature, t_1, for various rolling periods. This family of curves is shown in the upper half of Fig 1. These curves provide the operating engineer with information to aid him in safely prewarming the generator field.

Curves in the upper half of Fig 1 should be used only in conjunction with the field temperature at the beginning of the steam-rolling period. They are based on the rotor being prewarmed during the whole of the steam-rolling period. The duration of this period is governed by turbine conditions and the field temperature at the beginning of the period.

When the controlling turbine casing metal temperatures have fallen below 500F, the turbine may be warmed while it is still on turning gear and before it is rolled. Furthermore, the subsequent rolling period is increased. Its duration depends upon the level of these temperatures and may be 30 min or longer. While the initial field temperature has also fallen, it may still be high enough so that the rotor prewarming can be done entirely wthin the longer rolling period.

When the unit is to be shut down for only a short period, such as a weekend, the cold gas temperature must be raised to about 60C before the unit is shut down. This is done to provide a higher initial field temperature at the end of the shutdown. This allows rotor prewarming to be completed in the longer time which is required for turbine starting.

In some instances, initial field temperature is low and the rolling time fixed by turbine-starting considerations is short. Under these conditions equation (5) yields values of field current in excess of the manufacturer's recommended maximum. The maximum current can be applied then to the field windings while the unit is rotating on turning gear. Heat removed by the gas is reduced to a negligible quantity. An analysis similar to the foreging produces equation (6).

Difference Negligible

Curves in the upper half of Fig 1, which represent equation (5), are based on the initial temperatures of the field coils and rotor forging being the same. In equation (6), t_5 is clearly not equal to t_4. However, it has been calculated that the practical effect of their difference on the magnitude of current required during the subsequent rolling period is negligible. Consequently, curves in the lower half of Fig 1 have been plotted assuming that $t_5 = t_4$. They show the time, θ, plotted against the initial temperature, t_1, for various temperatures t_4.

A set of prewarming curves for our Gould Street 112.5-Mva No. 3 Unit is shown in Fig 2. It can be seen that the equations yield similar curves for each unit, the curves changing only with rotor weight.

Several field tests have been made on units within the company's system using the curves of Figs 1 and 2 for both steam-rolling-period and turning-gear prewarming operations. Results were typical of those achieved with these curves. This test was on Riverside No. 3 Unit, a 60-Mw preferred-standard machine. When it was returned to service during July, 1956, following a maintenance outage, the turbine metal was at room temperature. With temperature-controlled turbine-starting procedures, this condition did not govern the duration of the steam-rolling period. Average stator temperature by RTD measurements of 32C was assumed for a shutdown of this length to be the same as the forging and winding temperatures.

Rolling Period 180 Min

With the turbine warm enough to be rolled, and no prewarming of the generator while the unit was on turning gear, the minimum rolling period was selected from Fig 1. A period of about 180 min was found at the intersection of the 420-amp maximum-permissible-current line with the 32C initial-field-temperature line. A temperature-time plot of measured field winding, stator and cold gas temperatures, and calculated rotor forging temperature is shown in Fig 3.

At the end of the prewarming period, the stator, hot gas, and cold gas temperatures were all above 55C. The forging temperature was calculated to have reached about 60C. The drop in the average field winding temperature toward the end of the prewarming period was caused partly by an increase in the gas circulation rate as rotor speed increased and partly by the reduction in the field current to prevent armature overvoltage.

The manufacturer has stated that when the final stator, gas and field winding temperatures have all reached 60C, the rotor forging temperature has reached a satisfactory level. This assurance is based on a much more exact theoretical analysis of the heat transfer problem. It will be observed from Fig 3 that the stator temperature reached 60C within the prescribed prewarming period. In accordance with the conditions for equation (5), the prewarming period was made the same as the rolling period. Other tests

using rolling times have produced similar results. Prewarming tests on a 112.5-Mva unit are illustrated in Figs 4 and 5.

Several precautions should be observed during prewarming. With the rotor rotating on turning gear, the end turns heat much faster than the rest of the winding. This is because heat generated in the end turns is dissipated almost wholly by conduction along the bars to the rotor forging. Caution should be used to avoid exceeding the 80C maximum average winding temperature recommended by the manufacturer. Where step-up transformers are connected directly with the generator terminals, high currents may be caused in the turning-gear motor circuit by low-frequency hysteresis and eddy-current losses.

Break Field Current

To avoid burning the collector rings, electrical interlocks and alarms should break the field circuit should the rotor stop turning. Each of the company's units covered by these prewarming procedures is provided with two instantaneous current relays in the turning-gear motor circuit and a position switch on the turning-gear clutch mechanism. This combination breaks the field current when (1) the clutch is disengaged, (2) the turning-gear motor current becomes excessive, or (3) the current falls below normal. All units not so equipped have field-winding temperature recorders.

Baltimore Gas & Electric now has a sufficiently accurate guide for the safe prewarming of generator rotors. As the units become better instrumented, these guides may be revised to permit use of higher forging temperatures. Further theoretical and experimental work on transient heat flow and temperature distribution during the prewarming period no doubt will permit refinements in field-warming techniques.

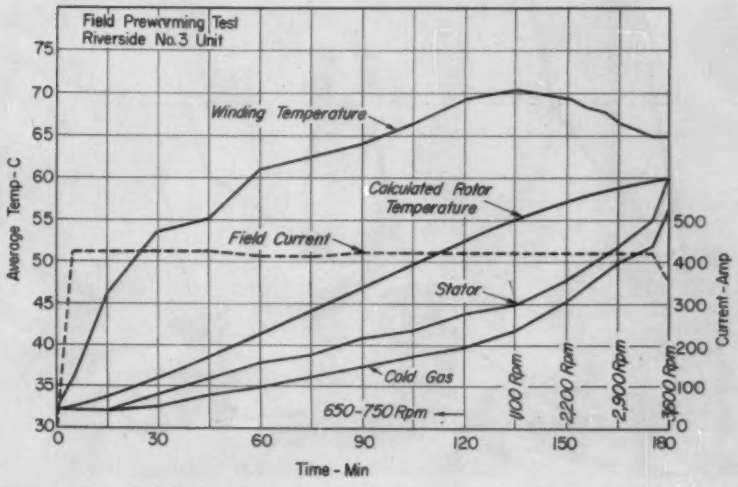


FIG 3—MINIMUM ROLLING PERIOD of 180 min was selected from Fig 1. No prewarming of generator was done while turbine was warmed on turning gear

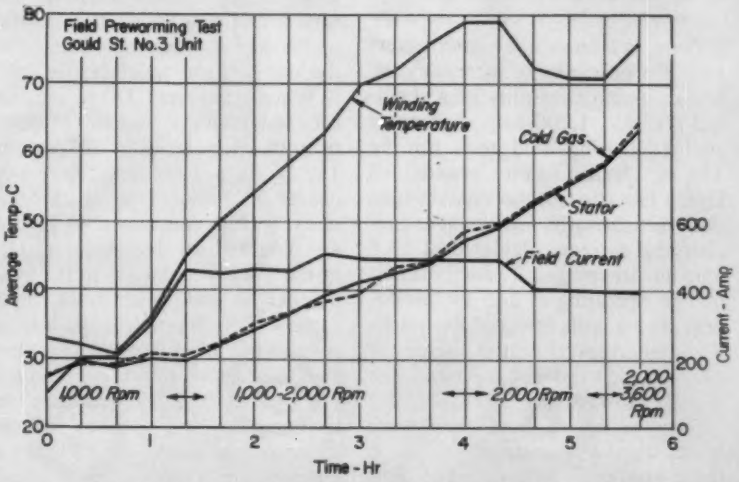


FIG 4—DURING LONG SHUTDOWN rotor cooled to 25C. Field current was raised during prewarming to reduce magnitude of drop in winding temperature which occurs at high speeds. Although attempt was not entirely successful, cold gas, stator, winding temperatures were above 60C as unit was to be synchronized

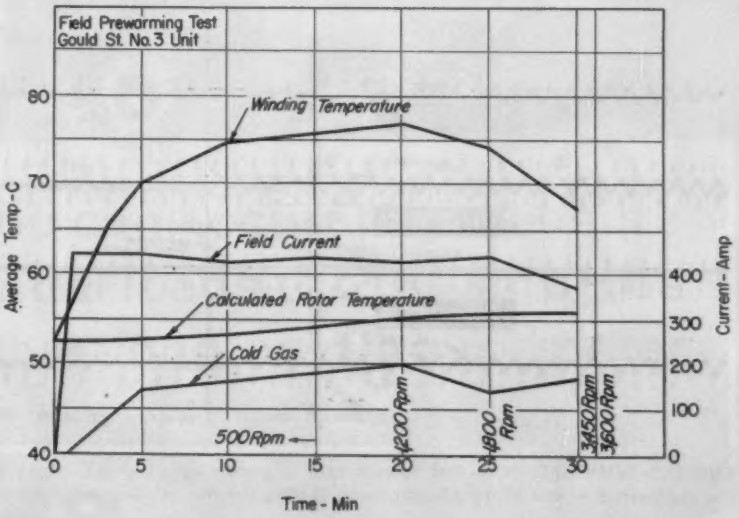
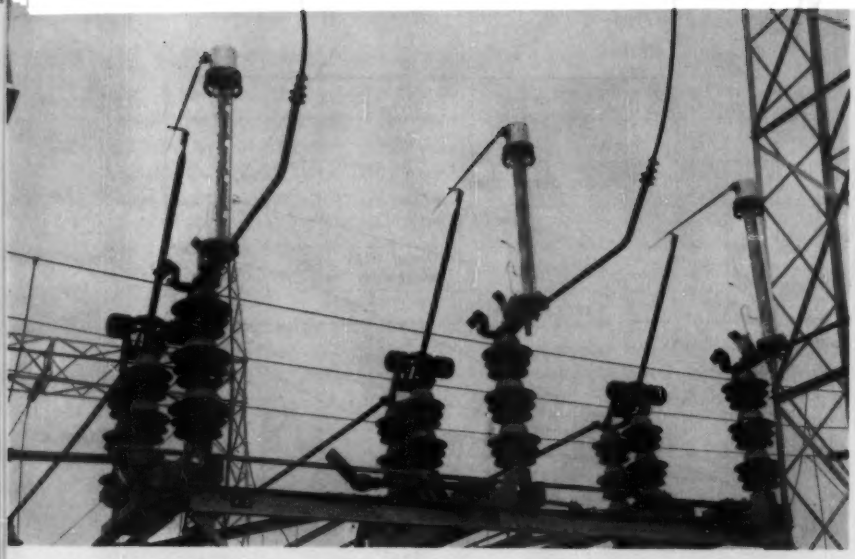


FIG 5—AFTER SHUTDOWN of 28 hr, turbine metal temperature set controlled start-up of 35 min. Field current was selected from Fig 2 for field prewarming during steam rolling. Stator temperature rose from 52.5C to 54.5C Cooling water leaking through gas coolers reduced cold gas temperature lower than desired.



Raise Capability of Disconnects

Vacuum-tube interrupters replace quick-break units after tests by Union Electric

R. W. KATTERHENRY, Senior Asst. Engineer, Union Electric Co, St. Louis, Mo.

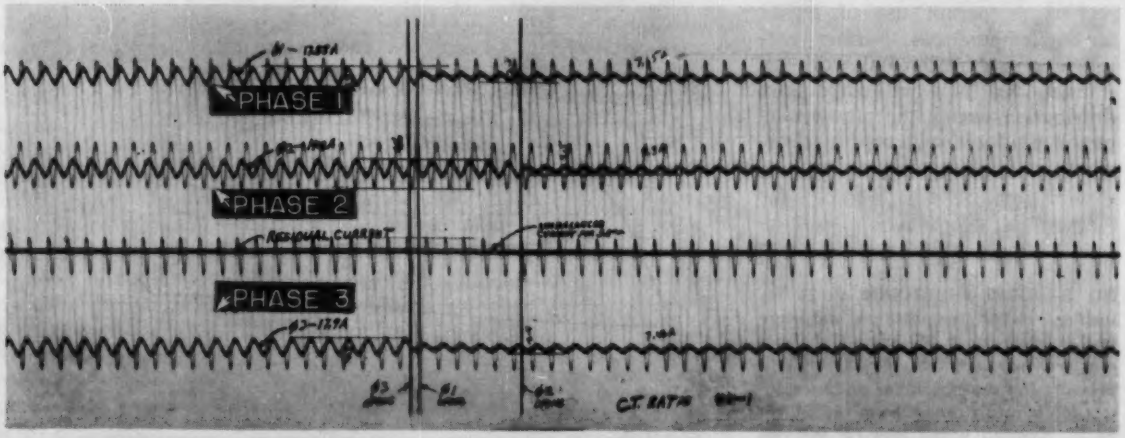
New vacuum-tube interrupters offer the possiblity of increasing the line-dropping capability of a standard 115-kv, 1,200-amp disconnect switch. During field tests on the 138-kv transmission system of Union Electric Co, the vacuum-tube units satisfactorily interrupted line-charging current calculated at 13.8 amp in dropping a 27.5-mi section of line operating at 145 kv line-to-line. These units replaced the quick-break interrupters on the disconnect switch which did not drop the line section satisfactorily.

Two series of field tests were made on the disconnect switch, a Delta-Star type MK-40. The first was to test the ability of the original type QB interrupters to interrupt line-charging current. One switch dropping 16.3 miles of 138-kv line was found adequate, but another which had to interrupt 27.5 miles did not perform satisfactorily.

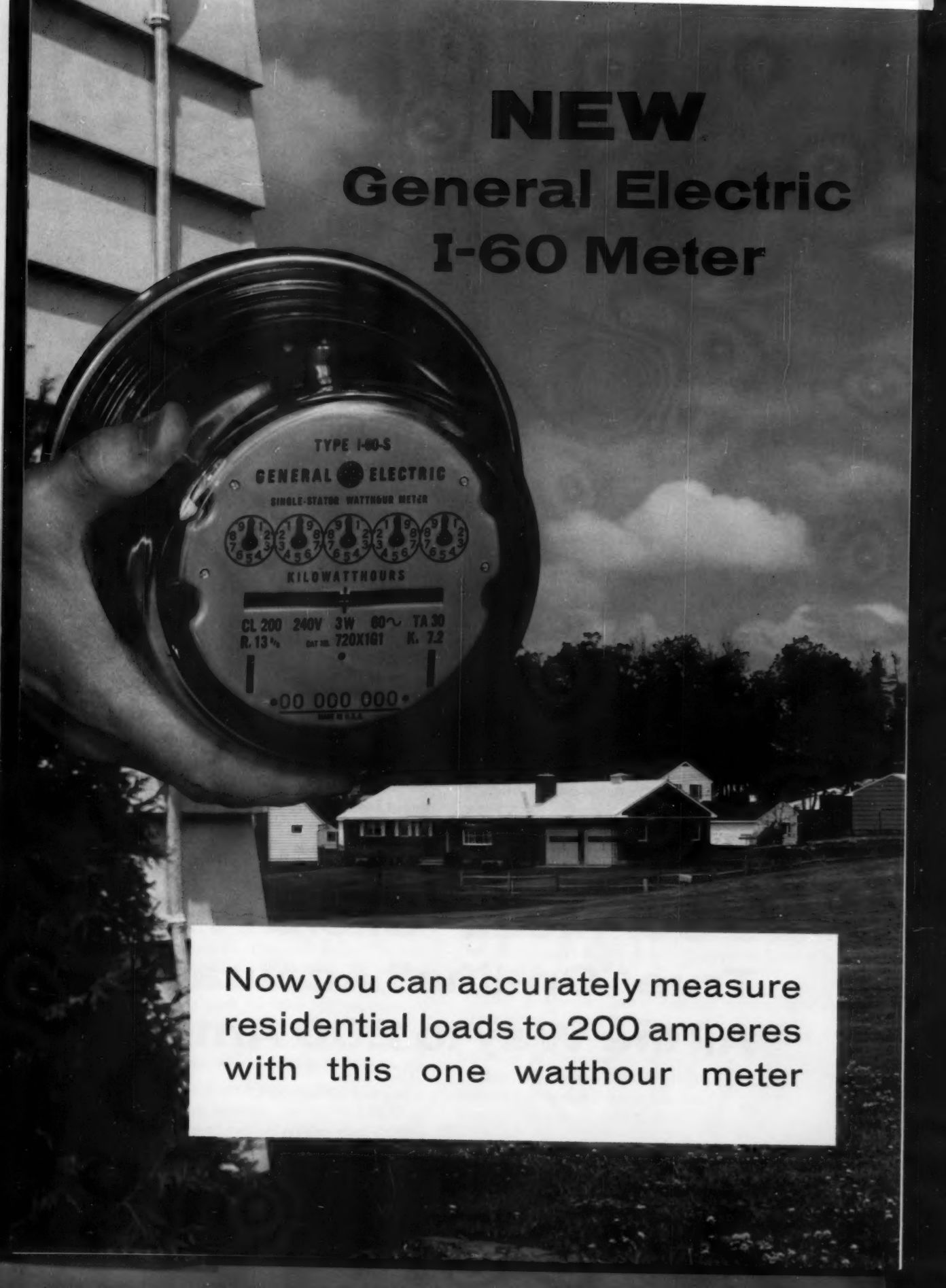
When the type JV-5 vacuum-tube interrupters became available from the manufacturer (EW, March 18, 1957, p 124), they were purchased to replace the quick-break units. The vacuum-tube devices are mounted on the insulator stack of the disconnect switch in the same manner as the quick-break interrupters. The simple change was attractive to Union Electric as it obviated redesign of substation steel and bus work. The vacuum-tube interrupter has five vacuum switches in series per phase all enclosed in a pyrex tube. The switches are made by Jennings Radio Mfg Co (EW, July 25, 1955, p 179).

During the line-dropping tests, oscillograms were made at Meramec plant. Values of currents and voltages during one of two opening operations at Bailey substation are shown in the accompanying illustration. Although the interrupters in the three phases do not operate simultaneously, the oscillogram shows the charging current in all cases was interrupted at the first current zero without voltage disturbance at Meramec plant. A disturbance was recorded during the closing operation because the disconnect switch does not close through the vacuum units. No arcs were seen in the vacuum switches.

During the tests, the line operated at 145-kv phase-to-phase. Charging current of the line was calculated at 13.8 amp at 145-kv, although it appears to be about 10 amp on the oscillograms.

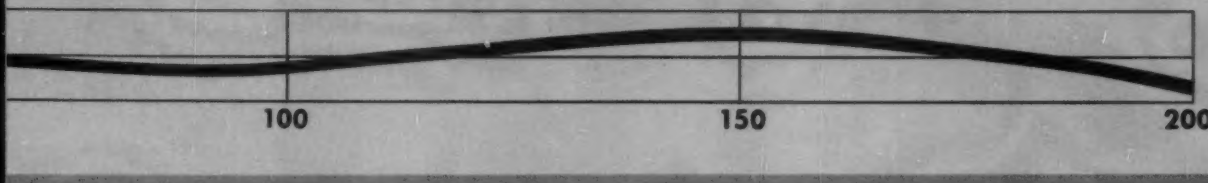


CURRENT INTERRUPTION at first current zero is shown by the oscillogram of one of the opening tests. During the closing test, there was some disturbance because the switch does not close through the vacuum-tube interrupters


NEW
General Electric
I-60 Meter
TYPE I-60-S
GENERAL ELECTRIC
SINGLE-STATOR WATTHOUR METER
KILOWATTHOURS
CL 200 240V 3W 60~ TA 30
R. 13⅓ DAT NO. 720X161 K. 7.2
•00 000 000•
Now you can accurately measure residential loads to 200 amperes with this one watthour meter

NEW General Electric I-60 Meter Offers You True "On-line" Accuracy All the Way to 200 Amps

for your residential loads today and in the future



FOR YOUR SINGLE-PHASE RESIDENTIAL LOADS, the new Class 200 I-60 watthour meter by General Electric gives you "on-line" accuracy at *both* light and heavy loads. This remarkable new meter was designed specifically to meet the expressed needs of metering men for a single-stator meter capable of accurately measuring loads *up to 200 amperes* with a metering investment *no greater* than for existing Class 100 meters.

PROVEN ACCURACY, UP TO 200 AMPERES, is shown by the "on-line" load curve of the I-60 meter. The outstanding characteristic of the I-60 meter is its "on-line" performance at the Class 100 meter test currents of 1.5 and 15 amps, as well as at the Class 200 test currents of 3 and 30 amps. And at a full 200 amps it stays within three-quarters of one per cent. This superior performance of the I-60 is unequalled in the history of metering.

YOUR METER INVESTMENT IS PROTECTED, now and in the future, by the low inherent cost of the I-60 Class 200 meter—an inherent cost no greater than existing Class 100 meters. A revolutionary new, lightweight stator, simple and efficient, contributes to the outstanding accuracy of the I-60 meter. This stator design allows you to benefit from substantial savings in construction and materials selection. With the I-60, you protect your important metering investment by getting a Class 200 meter *genuinely no more costly* than present Class 100 meters.

TIME-PROVEN ADVANTAGES OF MAGNETIC SUSPENSION—a General Electric development—give you greater sustained accuracy, freedom from bearing replacement, and virtually eliminate tilt-error problems. Only G-E meters with magnetic suspension bring you these benefits.

Whether you prefer Class 100 or 200 meters, General Electric has a meter to meet your needs. Ask your G-E Apparatus Salesman or Representative for all the facts on the new I-60. Write for bulletin to General Electric Co., Section 621-11, Schenectady 5, N. Y.

LIVE BETTER ELECTRICALLY

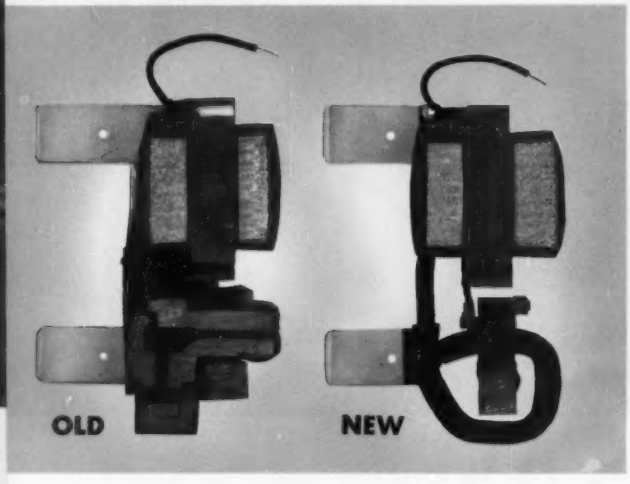
GENERAL ELECTRIC

NOW FROM GENERAL ELECTRIC

NEW Class 200 I-60 meter is inherently no more costly than present Class 100 meters

UNIQUE NEW STATOR CUTS MATERIAL COSTS IN CLASS 200 I-60 METER

A revolutionary new, lightweight stator design is incorporated in the I-60 meter, making its inherent cost equal to existing Class 100 meters. Comparing this I-60 stator to conventional Class 200 designs, there are substantial savings in copper and iron. Compromises in core designs and materials are eliminated by the simplified current coil and magnetic isolation of current and potential electromagnets. Spacing the potential-return laminations away from the current core eliminates undesirable intermingling of potential and current fluxes. Thus each electromagnet can best perform its measurement task.



The new current coil design is very simple compared to conventional split-coil designs found in other Class 200 meters. The elimination of current splitting minimizes error torques, inherent temperature errors, potential circuit losses, and undesirable effects on the phase angle of the potential flux. The new I-60 current coils are not fastened to the current core. Their new location and configuration permit optimum alignment of terminal blades in socket clips without affecting calibration. This creative engineering makes possible the I-60 meter's unprecedented accuracy all the way up to 200 amperes.

NEW I-60 OFFERS MAGNETIC SUSPENSION AND OTHER I-50 METER FAMILY BENEFITS

The benefits of magnetic suspension—a General Electric exclusive—are yours in the I-60 meter. With magnetic suspension, G-E Class 100 and 200 meters offer greater sustained accuracy, freedom from bearing replacement, and virtual elimination of tilt errors. Other I-60 features time-proven in the I-50 meter family are corrosion resistant finishes, coordinated insulation, and easy-to-read faceplate.

For complete details on Class 100 and 200 meters contact your G-E Apparatus Salesman or Representative or write General Electric Company, Section 621-11, Schenectady 5, N. Y.

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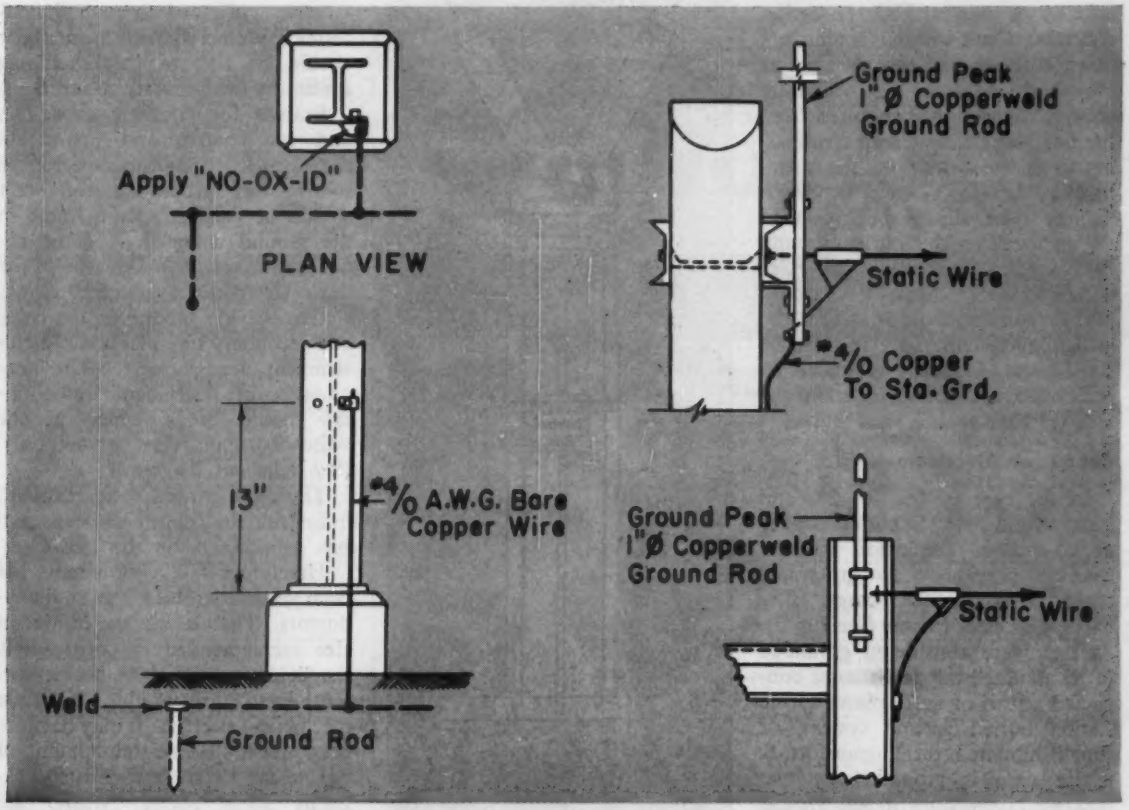


RECOMMENDATIONS for grounding connections: Fig 1 (left) —column base is grounded to buried ground system; Fig 2 (top right) and Fig 3 (lower right)—separate connection required from line side of clamp terminating static wire

GENERATION—Maintenance

Substation Grounding Practices Recommended

C. P. ZIMMERMAN, Head of Electrical Equipment Section, American Gas & Electric Service Corp, New York, N. Y.

The AG&E system has relied solely on copper or aluminum for conducting to ground the lightning surge and fault currents that enter a station from the static wires of transmission and subtransmission lines. This general practice extends to the discharge currents of station arresters.

The basic consideration is to obtain a reliable and direct low-resistance path for dissipating these currents into the ground to prevent the rise of dangerous voltages with minimum effect on the continuity and operation of the electric system. For years a 4/0 AWG copper ground bus has been carried down several columns and along the trusses on which arresters are mounted.

There has been no indication that this grounding practice has been unsatisfactory. This fact, however, should not deter a review with the objective of simplifying the practice without unduly sacrificing or compromising the protection. The real objective is to reduce station costs wherever experience indicates that it can be done safely.

Any simplification of the grounding method would reduce the total cost of any one station only a relatively small percentage. But over a period of a year or longer the total dollar savings on the system would be a sum that cannot be overlooked. Composite savings in individual items, components, or practices, however small, result in minimizing the total station costs. To develop these savings, our practices must be analyzed periodically so that we can be sure that they will justify themselves in the light of information and experience available.

Taking a look at present station grounding practice, one can readily appreciate that the copper paths for the surge and lightning arrester discharge currents are actually shunted by the structural steel. Despite its higher resistance per unit area, the total cross-sectional area of the steel members makes them carry practically all of the current assuming that there are no high-resistance joints or connections.

This observation leads to the following recommendations for sta-

(*Continued on page* 98)

tion ground practice for 66, 44, 33, and 22-kv steel structures, either latticed or non-latticed, H-section columns. Omit ground conductors down columns and rely on steel as the current path. A separate ground connection is required from the line side of the clamp terminating each static wire on the structure as in Figs 2 and 3. Each column base should be grounded with copper to the buried ground system (see Fig 1). Anchor bolts and concrete reinforcing steel should never be considered part of the grounding system. Arresters will be considered adequately grounded by the bolted connection fastening the arrester base to the steel truss.

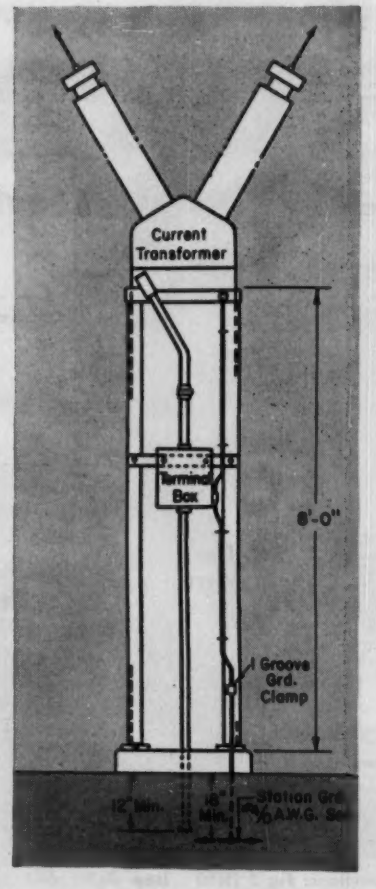
Copper or Aluminum Used

In the case of 66, 44, 33, and 22-kv wood pole structures, copper or aluminum conductor will be used as previously for grounding static wires, switch bases, fuse bases, and steel trusses (see Fig 3). Arresters are considered grounded (a) if mounted on steel trusses connected at two or more places to the station buried ground system, or (b) if mounted on a transformer whose case is grounded by two separate connections to the ground system.

These are the recommendations for 12 or 4-kv structures. These outdoor station structures are designed for nominal 13.2 or 12-kv or lower distribution voltage facilities generally wye-connected with the neutral solidly grounded in the station. Hence it is necessary to have a neutral bus for connection of the individual feeder neutrals when there is more than one feeder from the station. This neutral bus need not be insulated where 3-phase power transformers are used.

But the neutral bus to which the neutral bushings of single-phase power transformers are connected must be insulated and a single connection should be made from this bus to the buried ground system. Firm grounding of the neutral bus is essential from a safety standpoint because the integrity of the connection between the source (transformer bank) and the feeder neutral must be maintained.

Arresters in these structures may be grounded to the steel truss on which they are mounted.



Lightning arresters mounted on transformers are considered satisfactorily grounded through the arrester base; but the transformer base should be tied to the grounding system by two separate connections.

Frames for coupling capacitors and for control and instrument transformers should be treated as follows. A grounding conductor should be carried up the frame to the ground connection of the capacitor, or for grounding one of the secondary-phase conductors of the station service supply, or the cases and secondary terminal boxes of instrument transformers. The secondaries of instrument transformers should be grounded at the switchboard or relay cabinet only. (See adjacent diagram.)

The only ground connection required on the frames for traps and bus supports is on the frame leg.

Heretofore 4/0 AWG copper has been generally used for ground conductors. That is still the minimum size recommended to carry safely the lightning and short-circuit currents and to provide adequate mechanical strength. It may be more economical to use aluminum of equivalent short-time carrying capacity (336 MCM ACSR) for grounding conductors above ground. This may present a small problem in stocking, as both copper and aluminum conductors would be used in a station ground system.

Because of corrosion, aluminum should not be used below ground. Cadmium-plated connectors should be used for connecting copper and aluminum conductors.

Regardless of whether steel, aluminum, or copper carries the surge or short-circuit currents, it is important that all connections be tight and of low resistance and remain so after years of service.

Causes of Boiler-Tube Leakage Traced

CECIL E. SHAY, Operation-Supervisor, Muskingum Plant, Ohio Power Co, Beverly, Ohio

Leaks developed in the furnace-roof tubes of Muskingum River plant's Unit 1 boiler about 21 months after it was placed in operation. Six leaks developed during September and October 1955.

After cutting out the faulty tube section or cutting windows in the tops of tubes to permit repairs, plant maintenance crews found black-oxide carbuncle type deposits in the bottoms of the roof tubes. The deposits were about 1½-in. wide by ½-in. thick, and their lengths ranged from 2 to 8 in.

After analyzing samples, AG&E and B&W laboratories concluded that the probable cause of the de-

(*Continued on page* 104)

NOW: From General Electric's
Regulator Engineers:
A Chart Designed To Help You . . .

COMPARE REGULATORS

Single-phase Step Voltage REGULATOR FEATURE	G-E	A	B	C	MEANING OF FEATURE
Electrostatic Shielding	YES	NO	NO	NO	Helps prevent build-up of arc-causing carbon deposits at critical points.
Controlled Switch Speed	YES	NO	YES	YES	Gives longer contact life. Means less maintenance.
32 ⅛% Step Regulation	YES	YES	YES	NO	Provides closest voltage control. Less contact wear.
Locking Screws On All Control Knobs	YES	NO	NO	NO	Makes sure that settings stay set.
Panel-mounted Reverse-Reactance Switch	YES	YES	NO	YES	Simplifies parallel or delta-connected applications.
Plug Connections On All Major Control Components	YES	NO	NO	NO	Allows easier, quicker maintenance of control.
Complete Range of Ratings	YES	YES	NO	YES	Facilitates your system planning.
One-piece Cover Bands	YES	NO	NO	NO	Simplifies maintenance. Pleasing appearance.
Aluminum/Copper Terminals	YES	NO	NO	NO	Offers flexibility; either type of conductor can be connected.
Lightning Arrester For Control Circuit	YES	YES	YES	NO	Provides additional protection to vital regulator controls.
Internal Thyrite* By-Pass Resistor	YES	NO	NO	NO	Affords maximum protection with no chance of external damage.
Steel Control Panel	YES	NO	YES	NO	Provides rigidity. Panel will not warp or break.

FOR MORE INFORMATION on the benefits your system can get with General Electric feeder voltage regulators, contact your G-E Sales Representative or write Section 423-19, General Electric Co., Schenectady 5, N. Y.

*Registered Trademark of General Electric Company for Resistance Material.

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GENERAL ELECTRIC

NEW
ENGINEERED TERMINALS
NEW
ALUMINA CERAMIC BUSHINGS
NEW
RECTANGULAR DESIGN
NEW
CORROSION RESISTANT FINISH
PLUS . .
MULTI-ROLL ASSEMBLY efficiently transfers heat away from the center of the unit. By permitting cooler internal operating temperature, this feature lengthens capacitor life.

THE ALL NEW GENERAL ELECTRIC RESIDENTIAL SECONDARY CAPACITOR

for safer, longer, more economical service

Now General Electric offers a completely new secondary capacitor built to give longer, safer, more economical service on your residential feeders. Every new feature of this smaller and 33% lighter capacitor is especially designed to increase its electrical efficiency.

RECTANGULAR CASE, with flat sides to allow for internal expansion and contraction, permits complete impregnation of unit. This virtually eliminates the possibility of internal failure caused by voids in the liquid dielectric. The easy-to-install unit can be mounted in any position without changing the electrical strength.

SUPERIOR ALUMINA CERAMIC BUSHINGS provide four times the tensile and flexural strength, and five times the compression strength of old style wet porcelain bushings. A high-temperature brazing process bonds the bushing to a corrosion-resistant metal cap and flange.

NEW ENGINEERED TERMINAL provides a corrosion-resistant electrical connection that accommodates either copper or aluminum conductors up to #4 size. The two connector components are held tightly together by a brass nut and lock washer. Since the nut is made of softer metal, it will strip before the stud, if excessive torque is applied.

CORROSION-RESISTANT FINISH withstands rain, snow, salt-fog, and contaminated atmospheres. The entire capacitor—case, terminal, bushings and bracket—is fabricated from materials designed to resist corrosion, even under the most severe climatic conditions. Protective repainting will never be necessary.

The all-new G-E secondary capacitors are available in 3, 5, and 7½-kvar sizes. For more information, contact your nearest General Electric apparatus sales engineer or write for bulletin GEA-6670, General Electric Co., Section 445-10, Schenectady, New York.

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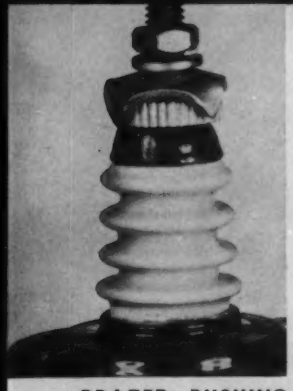
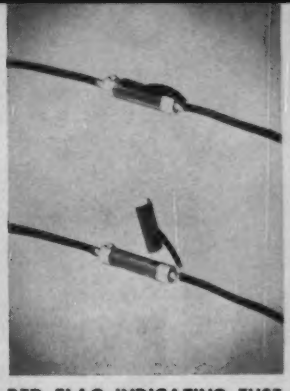
. . . THESE EXTRA FEATURES



BRAZED BUSHING FLANGE, spot welded and then heremetically sealed, eliminates need for gaskets.

SIMPLIFIED MOUNTING BRACKET meets EEI-NEMA lightning arrester-cutout specifications. Unit can be mounted with bushings up, down, or sideways; on the pole or on the cross-arm.

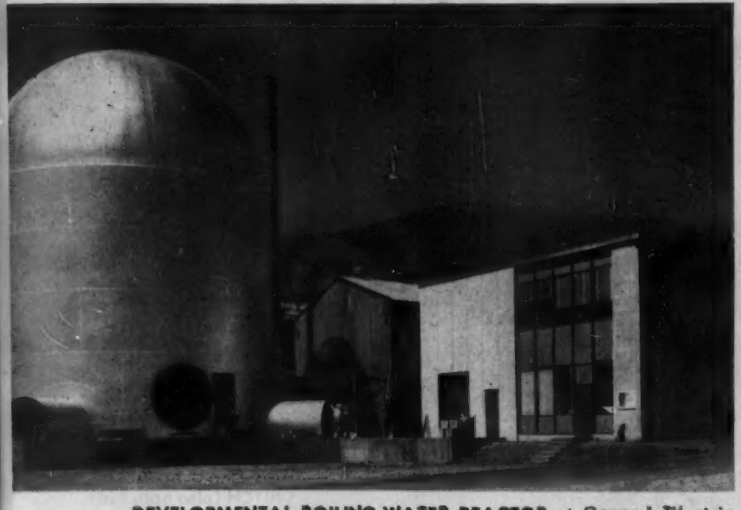


RED FLAG INDICATING FUSE (optional at extra cost) allows easy detection from the ground when current rating of fuse has been exceeded.

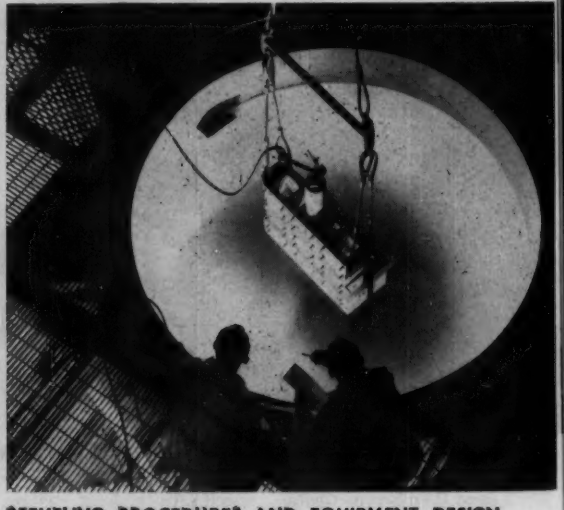
WEATHER-PROTECTED THERMOSTATIC SWITCH (also optional) automatically controls operation of capacitor.

PROGRESS REPORT ON DRESDEN STATION

GENERAL ELECTRIC DUAL-CYCLE BOILING WATER REACTOR will be housed in 190-foot steel sphere on foundation already completed at Dresden site. Turbine building construction, lower left, is well under way.



DEVELOPMENTAL BOILING WATER REACTOR at General Electric Vallecitos Atomic Laboratory will furnish vital operational data to be used for Dresden Station. Turbine-generator for facility will be owned and operated by Pacific Gas and Electric Company.



REFUELING PROCEDURES AND EQUIPMENT DESIGN are studied in 54-foot-high refueling test tank in San Jose. Tank simulates reactor pressure vessel conditions, including heat and water-circulating factors.

Full-scale construction begins on world's largest all-nuclear power station

WORK ON GENERAL ELECTRIC-DESIGNED DRESDEN NUCLEAR POWER STATION MOVES AHEAD "ON SCHEDULE"

A milestone in atomic progress was passed June 12 with the start of major construction on Commonwealth Edison Company's Dresden Station. During brief ceremonies at the site one of the huge columns which will support the 190-foot sphere was swung into position and bolted into place by key officials.

Plant engineering for Dresden's dual-cycle boiling water reactor is over 55 percent complete. General Electric and the Bechtel Corporation (engineer-constructor) have let contracts to over 175 companies who are fabricating various parts of the plant.

General Electric is utilizing its development facilities at its Atomic Power Equipment Department in San Jose, California and its near-by Vallecitos Atomic Laboratory for the Dresden reactor. More than $31,000,000 has already been paid out or committed for materials and equipment.

A pioneering spirit is being demonstrated at Dresden. Commonwealth Edison and General Electric, in co-operation with the Nuclear Power Group, Inc., have displayed industrial leadership in developing a new concept of power generation which will make the peacetime atom a working reality in the Chicago area by 1960. General Electric Co., Atomic Power Equipment Dept., San Jose, California.

For more information, write for bulletin GER-1301, Progress Report on Dresden Station, General Electric Company, Section 192-11, Schenectady, New York.

MEMBERS OF THE NUCLEAR POWER GROUP, INC.—American Gas & Electric Service Corp., Commonwealth Edison Company, Pacific Gas & Electric Company, Union Electric Company of Missouri, Illinois Power Company, Kansas City Power & Light Company, Bechtel Corp., Central Illinois Light Company.

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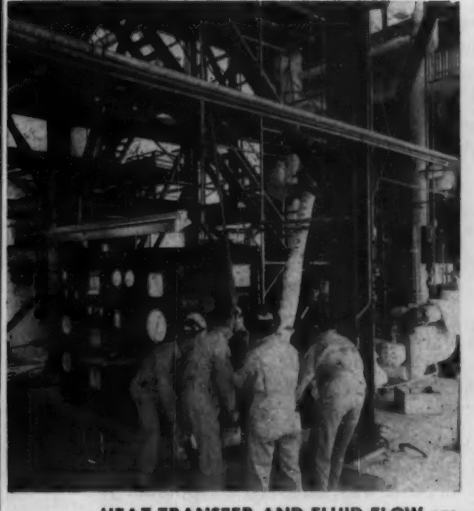
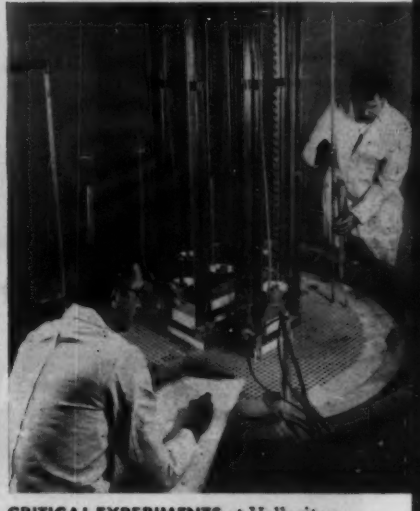
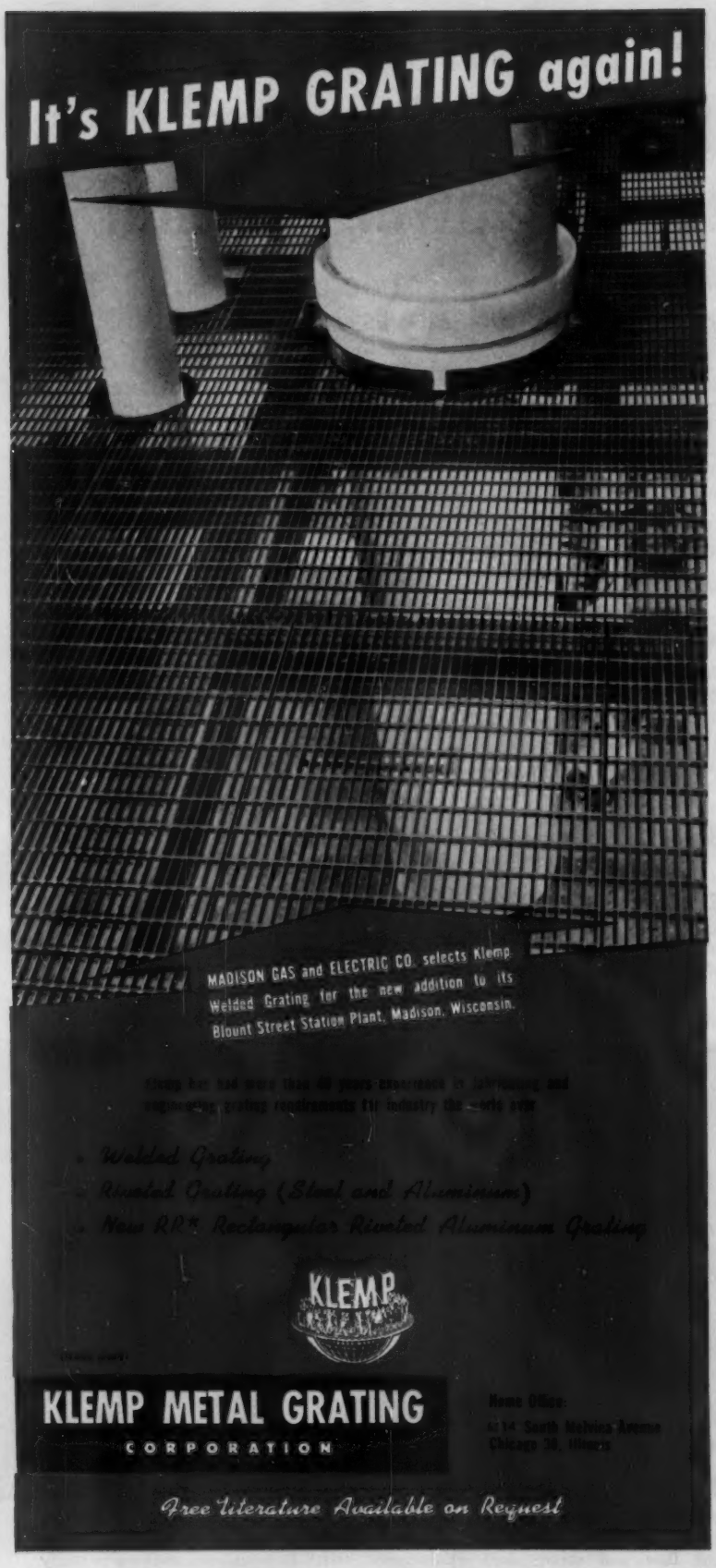


HEAT TRANSFER AND FLUID FLOW are tested in this special test loop designed for study of void distribution, steam slip, steam blanketing and heat transfer.

TWO-PHASE FLOW TEST mock-up of dual-cycle BWR steam system simulates coolant flow and steam void characteristics for this type reactor's coolant system.



CRITICAL EXPERIMENTS at Vallecitos Atomic Laboratory will be performed with Dresden core mock-up to study core configurations and fuel loadings.


It's KLEMP GRATING again!
MADISON GAS and ELECTRIC CO. selects Klemp Welded Grating for the new addition to its Blount Street Station Plant, Madison, Wisconsin.
Welded Grating
Riveted Grating (Steel and Aluminum)
New RP* Rectangular Riveted Aluminum Grating
KLEMP
KLEMP METAL GRATING
CORPORATION
Free literature Available on Request

Boiler-Tube Leakage

(*Continued from page* 98)

posits was some type of dirt which had localized in certain spots and reduced the heat transfer enough to cause oxidation. In an attempt to correct the situation, Unit 1 boiler was acid washed in November 1955.

In June 1956 Unit 2 boiler developed a roof-tube leak. A similar carbuncle type deposit was found inside the tube. This was the first leak of this type in Unit 2 boiler, although some of unit's tubes had been opened at random and explored for carbuncles but none was found.

The deposit in the leaking tube was carefully removed in two pieces and taken to the laboratory for examination. A strange indentation was observed in the top of the carbuncle, but not much thought was given to this peculiarity then.

Data Needed

Up to this time we had theorized on the cause of the carbuncles and leaks, but no concrete evidence had been found to substantiate the initial theory. The cause remained a mystery.

After the carbuncle had been removed from Unit 2 boiler, we examined the inside of the tube and questioned the man who had cut it open and scraped out the dirt and cuttings. In this refuse we found a piece of oxidized hacksaw blade about 6 in. long. Apparently, it had been in the tube, judging from the amount of metal wasted away.

Assuming the blade was the key to some of the plant's trouble, we brought it to the laboratory. It fitted perfectly into the indentation previously observed in the top of the carbuncle.

Undoubtedly, the hacksaw blade had been left accidently in the tube and had disrupted the heat transfer to such an extent—probably by trapping steam bubbles between itself and the tube—that local overheating occurred, causing the tube to oxidize. Oxide formation had started under the blade, raising it until about ½ in. of black oxide separated it from the tube.

Why hadn't the hacksaw blade been observed when the carbuncle deposit was removed? Apparently,

(*Continued on page* 106)

the plant that customers built
SOUTHWIRE serves the world
AERIAL VIEW of Southwire's expanded facilities which now occupy over 200,000 square feet.

Southwire's greatly expanded plant means more products, faster service

Our customers are responsible for Southwire's rapid growth from a plant of 10,000 square feet in 1951 to the present one of 200,000 square feet. For this we are grateful.

But it took two things to get the customers and hold on to them: *quality products and superior service.*

Today the name Southwire is known from coast to coast and in many foreign lands. It applies to dozens of products used in transmission and distribution systems, and in the building industry.

The greatly expanded facilities of Southwire stand not only as a tribute to our customers, but as a promise of greater things to come: a wider range of present products, the development of new products, and a continuation of the policies that have built solid customer satisfaction.

Specifying Southwire is your best assurance of quality and service, plus a full measure of gratitude from all the men and women who make up the Southwire Company.

• products produced for the electric and allied industries

Southwire® Company

TErrace 2-6311 CARROLLTON, GEORGIA

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and Southwire Vinyl Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

because ONLY ELECTROMODE HEATERS HAVE THE SAFETY GRID

This is a completely sealed-in **CAST-ALUMINUM HEATING ELEMENT.** Absolutely no glowing elements or exposed open coils. Tops in safety, efficiency and economy. The Electromode heating element is guaranteed for five years.

because ELECTROMODE LEADS IN ELECTRIC HEATING

ELECTROMODE
Division Of
COMMERCIAL CONTROLS CORPORATION

For more than a quarter century Electromode has concentrated on one specific industry—heating by electricity. From the beginning Electromode has pioneered for a quality product and has continued to expand its line to include the most modern developments in electric heating equipment to serve present day needs. As a result of Electromode's firm stand on quality, complete satisfaction has been the rule with those who either sell, install or use Electromode electric heating equipment.

MAIL COUPON TODAY

MAIL COUPON! Please send your FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating.

ELECTROMODE Division
Commercial Controls Corporation
Dept. EW-87 45 Crouch Street, Rochester 3, N. Y.

We are interested in ☐ Home ☐ Industrial ☐ Farm

Name.....

Address.....

City.....Zone.....State.....

Boiler-Tube Leakage

(*Continued from page* 104)

when the top of the tube was cut out with a gas torch, the blast had blown the blade from its initial position up about 6 in. into the tube.

This was the first concrete evidence uncovered as to the cause of the tube failure.

In July 1956, Unit 1 boiler developed another roof-tube leak. Our experience prompted us to cut out the top of the tube very carefully so as not to dislodge foreign matter that might be there. When the tube was opened, the remains of a 12-in. piece of welding rod were found lying in the top of the black-oxide deposit as the hacksaw blade had been found previously.

Since then several leaks have developed at welding rings where poor fusion to the tube metal had formed a ledge. Apparently, this ledge had built up deposits which reduced heat transfer, thus causing the failure.

Although these boiler-tube failures were somewhat unusual, similar failures are possible in any relatively horizontal boiler tube with high-heat input along the bottom. Placing field welds made with backing rings in heated horizontal or near-horizontal tubes appears to be a questionable practice and is being studied with the boiler maker.

Failures Found in Verticals

Tube failures immediately upstream from the field welds have been experienced in vertical furnace tubes by other utilities and were believed to have been caused by localized steam-blanketing resulting from the slight nozzle effect of the internal weld-backing rings.

Regardless of the circumstances of these particular tube failures, there is a practical lesson to be learned. In investigating and repairing tube failure, it is important to avoid unnecessarily disturbing internal conditions which could provide a clue to the cause.

It is advisable also to arrange for as many qualified people as practicable to review the evidence, thus minimizing the chances of overlooking some of the more obscure conditions which might lead to the solution of the problem.

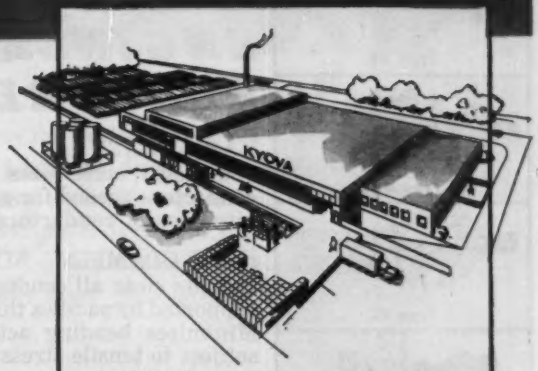
(*More How To on page* 108)

YOU SAVE 20% IN HANDLING AND JOINING TIME!

KYOVA'S ten-foot lengths save you time, work, money—mean 20% *less handling* in unloading from carrier, loading at your storage area and unloading at the trench. With labor costs rising, consider the importance of these basic KYOVA advantages:

- **KYOVA 10-FOOT CONDUIT saves hours of loading and unloading time**
- **KYOVA 10-FOOT CONDUIT is laid faster and easier than shorter ducts**
- **KYOVA 10-FOOT CONDUIT requires fewer joints —speeds installation**

KYOVA conduit is light, easy to handle, can be cut with a handsaw. You make joints quickly, easily by tapping couplings onto the conduit's tapered ends. Joints are watertight, safe from seepage. KYOVA offers you 2", 3", 3½", 4", 4½", 5" and 6" sizes, and all accessories. Five-foot lengths are available on special order.



***KYOVA**—the new name in bituminized fiber conduit—is staffed by "key men" with more than 100 years combined experience in serving the electric utility industry. Headed by William D. Kyle, Jr., President, Kyova operates the newest plant in the industry, specially designed and equipped for manufacturing fiber pipe products. Ultra-modern processes assure products conforming to or exceeding all national standards and requirements.*

KYOVA

For complete information, write Jack Dallenmaier, V.P.

KYOVA FIBER PIPE COMPANY • IRONTON, OHIO

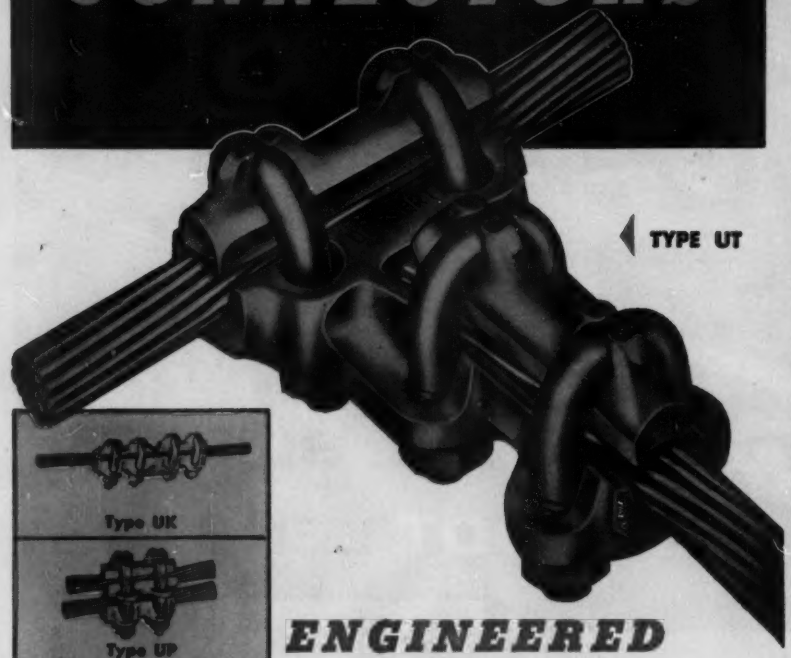
Fast to make fast!

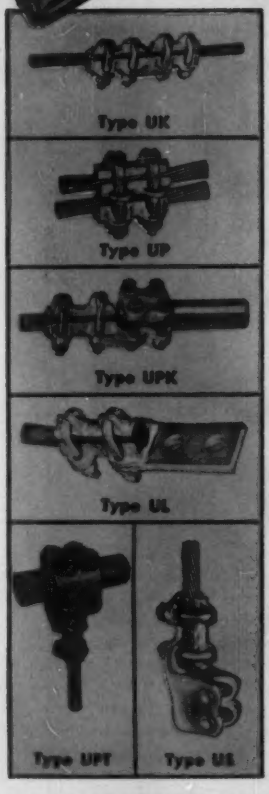
Safe, swift cable connections with

DOSSERT

U-BOLT

CONNECTORS





ENGINEERED FEATURES:

VARIABILITY
Fits many cable sizes, reduces number of connectors needed for given number of combinations of conductors.

HIGH CLAMPING ACTION
U-Bolts clear all conductors by close limits, supported by saddles through their full arcs. Minimizes bending action, makes U-Bolts subject to tensile stress only.

CABLE END RELIEF
Allows for distortion in free ends of strands, ample room for binding end of stranded cable if desired.

CONDUCTIVITY
High copper alloy with sufficient contact area to insure cooler-than-conductor operation under maximum load.

Available for aluminum or aluminum to copper conductors.

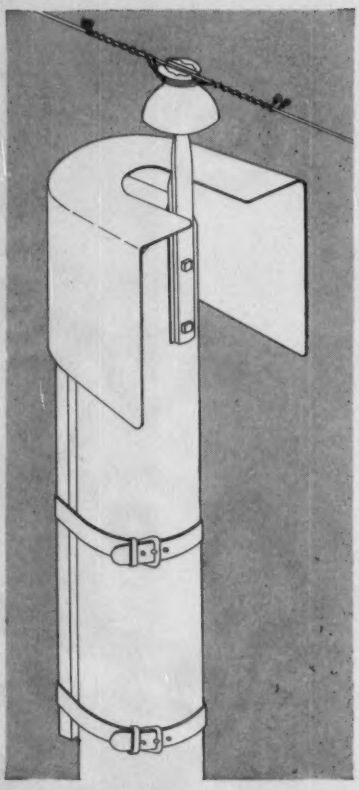
Excl. Canadian Distributor: W. S. Gerrie & Assoc. Ltd.
66 Racine Road, Rexdale, Ontario

WRITE FOR DETAILS AND PRICES TODAY!

50 YEARS OF TECHNICAL KNOW-HOW

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn 22, N. Y.



COVER was made of one end of an insulator cover, a line guard handle and two leather straps with buckles

Tying and Untying 13.2 Kv Made Safer and Faster

H. M. WADE, Overhead Lines Division, Indianapolis Power & Light Co, Indianapolis, Ind.

To tie or untie safely a conductor on a 13.2-kv pole, top-pin construction, care must be exercized to avoid contact of the tie wire with the pole. The problem has been simplified on the Indianapolis Power & Light Co system by a special protective device.

Insulator Cover Cut

One end of an insulator cover is cut to permit the cover to go around the pole. A line guard handle, tested at 7,500 v per ft, is attached to this cover. Two leather straps with buckles are attached to the handle and are used to secure the cover to the pole.

This device was suggested by Lineman Thomas L. Finch Jr.

"I'll never replace VICTOR SUSPENSIONS... I just won't live that long!"

Men who purchase insulators are enthusiastic about the service records of VICTOR Suspensions. That's because VICTOR Suspensions are laboratory designed, manufactured under rigid quality controls and tested with the industry's most modern equipment.

Take the No. 900 Insulator shown above, for example. It has rugged, rounded corrugations for maximum strength and resistance to impact. Cap and ball bolt are thick, husky and galvanized to withstand severe service. Scientifically fitted glaze gives added strength and added protection against contamination.

Each insulator is proof-tested mechanically, then subjected to vigorous high frequency and 60-cycle flashover tests. When you buy VICTOR, you just can't buy better suspensions!

New.....

VICTOR CATALOG

Now ready for distribution is Victor's newest and most extensive catalog. One of the most complete in the field, it includes illustrations and data on many items being produced at VICTOR and not previously shown, up-to-date EEI-NEMA Standards, and an outline of VICTOR'S new plant, research, testing and manufacturing facilities. It's FREE! Write for *your* copy.

VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., INC.
VICTOR, N. Y.

When a job calls for ACSR...it calls for Anaconda

cable experience

Producing top quality transmission cable requires more than a ready supply of metal—copper or aluminum. The most vital ingredient of good cable is the manufacturer's *cable experience.*

The choice of metals may change, depending on economic or other considerations. But cable requirements and the skills and knowledge involved in making dependable transmission lines do not. Whether copper or aluminum . . . it will pay you to call on the Man from Anaconda.

Backed by the broadest line of wire and cable in the industry, in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs.

Multi-mill manufacturing facilities – strategically located across the country – assure speedy service. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

P. S. TECHNICAL ASSISTANCE. Anaconda field engineers have worked in advisory capacity on hundreds of complex jobs. They are ready to put their experience and knowledge to work on your problem. ST300

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM

ANACONDA®

FOR ALUMINUM WIRE AND CABLE

▲ **Lineman,** standing near slowly revolving reels of cable, uses sound powered phone to talk to cable-pulling crew about one-half mile away.

◀ **Highway for power.** Anaconda 336.4 Mcm ACSR installed through rugged Catskill Mountains by New York State Electric & Gas Corporation.

Bulldozer pulls cable from 4 or 5 reels up and over 5 pole dead end and on to the next H structure. "Cat" had to let itself ▼down mountainside by winch.

This display material . . . is used for new-home promotion, as . . .

CG&E Sells Adequate Wiring to the Builder

Cincinnati Gas & Electric Co has a simple but effective philosophy when it comes to adequate wiring. If you want it in the homes, then sell it to the builder!

And that's just what the company has been doing in a fabulous new suburb rising north of the city. The development, called Forest Park, is being spearheaded by Warner-Kanter Co. It will have homes in a variety of price ranges; all except the low cost ones will have Certified Adequate Wiring.

How does CG&E do it?

First of all, the utility noticed the rising demand for electrical living conveniences in previous Warner-Kanter building projects. In these, electrical features were optional. It capitalized on this demand by fostering good builder relations, and then giving the adequate wiring pitch. Here are CG&E's tactics:

The utility ordinarily knows well in advance when a project is being planned because it must provide service. At this stage, CG&E assigns two salesman to take care of all the builder's needs. When a new development is a-planning, they make calls, obtain plans, and get information on the load involved.

They see to it that temporary lines are run in to give the builder power to operate his saws and other mechanical equipment.

Get to Know Builder

Services such as these permit salesmen to become well acquainted with the builder or developer. They are then in a better position to tell the adequate wiring story, and he's more likely to listen. When Forest Park was planned, CG&E's representatives met with the architect and electrical contractor. Past experiences plus these discussions resulted in Warner-Kanter's decision to incorporate AW in their homes.

But that's not all. Other services that the untility provides include:

- Furnishing displays in model homes to call prospective buyer's attention to the advantages of Certified Adequate Wiring.
- Giving each adequately-wired house an illuminated house number.
- Passing out descriptive brochures to customers.
- Providing floodlights to light up model houses.
- Briefing house salesmen on the advantages of electrical equipment so they can sell better.
- Continuous newspaper advertising support. Ads give the adequate Wiring—Housepower story, and list builders and their model homes that are open to the public that day.

Note to Wiring Men: Drop the 'A' in NAWB

Everyone concerned with adequate wiring and Housepower take note: The National Adequate Bureau has changed its name to THE NATIONAL WIRING BUREAU, according to a recent announcement by C. T. Bremicker, Chairman of the Bureau. The announcement followed a unanimous vote of the Executive Committee in favor of dropping the word "Adequate" from the Bureau's name.

In announcing the change, Bremicker made the following points:

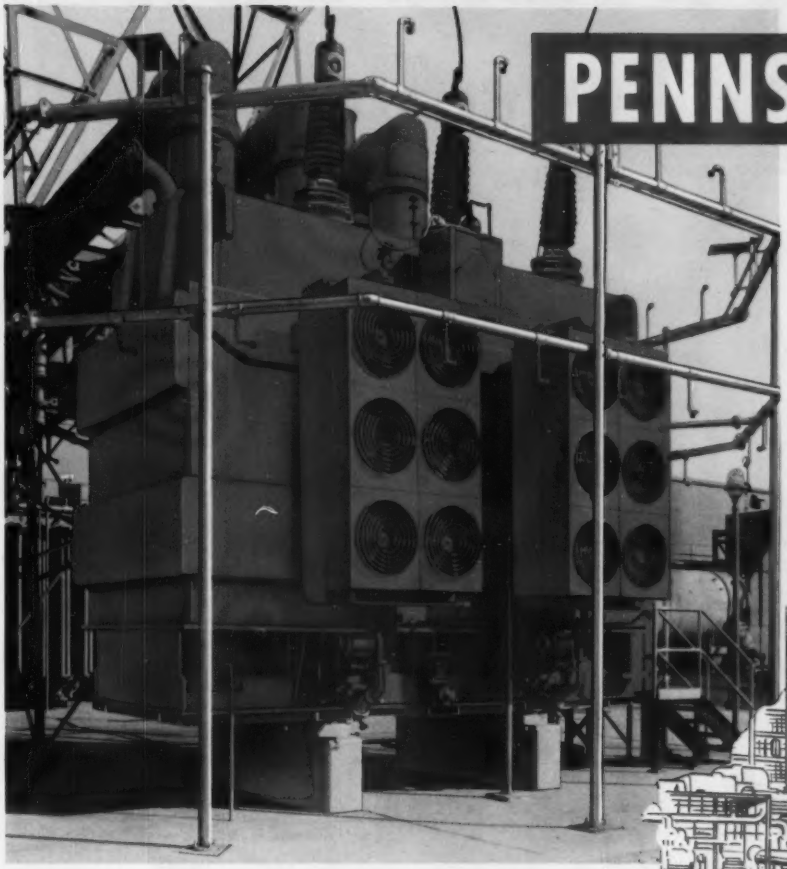
- Scope of the Bureau's program will not change.
- The Bureau will continue its a neutral position in regard to wiring methods and materials.
- Changing the Bureau's name does not impose any name-changing mandates on local bureaus.
- No change is contemplated for Wiring Certification Program, nor in the official certification emblem. So, too, for the companion emblem which reads "Adequate Wiring Serves and Saves".

(*More Selling on page* 116)

For the BIGGEST transformer job of all at Ninemile Point . .

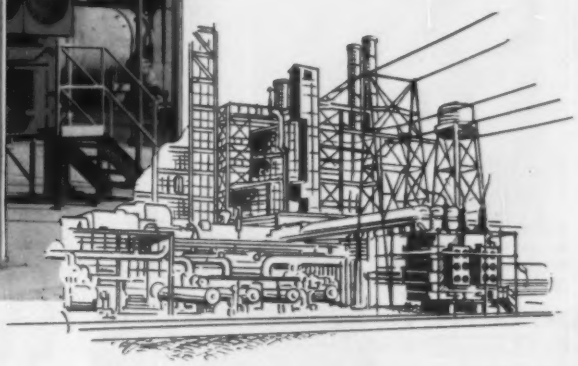
Louisiana Power & Light chose

PENNSYLVANIA



175,000 Kva PENNSYLVANIA POWER TRANSFORMER

in service at generating unit No. 3, at Louisiana Power and Light Company's Ninemile Point Station. High voltage: 115,500 Grd.Y volts. Low voltage: 17,500Δ volts.



Turbine-generating unit No. 3 at Louisiana Power and Light Company's Ninemile Point station has a net capability of 135,000 kilowatts. By far the largest unit in what is said to be one of the most fully automatic utility power plants in the country, No. 3 gives Ninemile Point a total generating capacity of 319,000 kilowatts.

For unit No. 3, a 175,000-kva Pennsylvania Power Transformer steps up the generated voltage of 17,500 volts to the transmission voltage of 115,500 volts. Only twenty feet in overall height, this transformer features Pennsylvania's shell form Contour Design, which permits even the highest capacity transformers to be shipped to the installation site in an upright position — completely assembled except for bushings and certain external accessories. As a result, less than four actual working days — with only four men working most of that time — were required to move this 175,000-kva Pennsylvania Transformer into position and ready it for connection to the line.

For installation economies as well as proved performance, it will pay you to check Pennsylvania regarding *your* next power transformer installation.
Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

pt

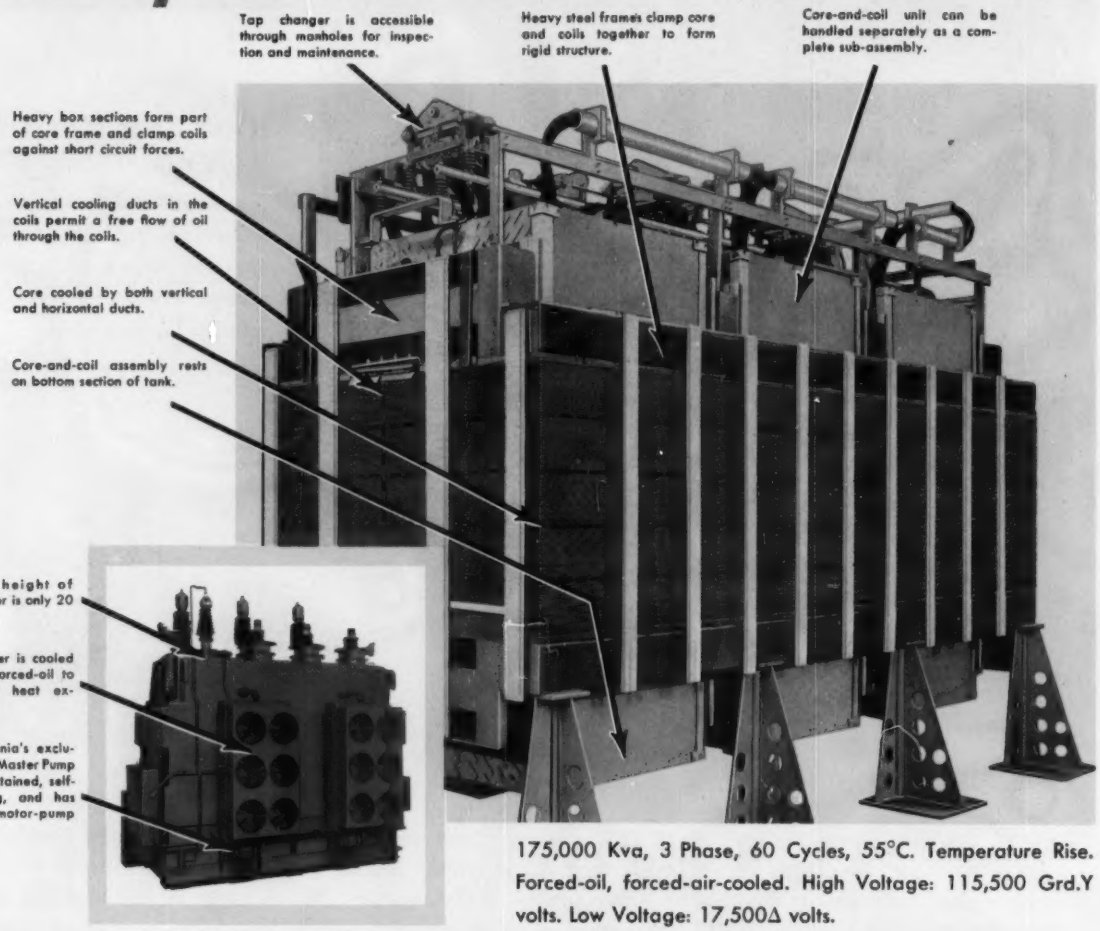
PENNSYLVANIA POWER TRANSFORMERS

See other side for design details

On unit No. 3 at Louisiana Power & Light's Ninemile Point Station . .

175,000 Kva CONTOUR DESIGN, GENERATING STATION

Pennsylvania Power Transformer


Tap changer is accessible through manholes for inspection and maintenance.
Heavy steel frames clamp core and coils together to form rigid structure.
Core-and-coil unit can be handled separately as a complete sub-assembly.
Heavy box sections form part of core frame and clamp coils against short circuit forces.
Vertical cooling ducts in the coils permit a free flow of oil through the coils.
Core cooled by both vertical and horizontal ducts.
Core-and-coil assembly rests on bottom section of tank.
Overall height of transformer is only 20 feet.
Transformer is cooled by four forced-oil to forced-air heat exchangers.
Pennsylvania's exclusive Seal-Master Pump is self-contained, self-lubricating, and has integral motor-pump shaft.

175,000 Kva, 3 Phase, 60 Cycles, 55°C. Temperature Rise. Forced-oil, forced-air-cooled. High Voltage: 115,500 Grd.Y volts. Low Voltage: 17,500Δ volts.

PENNSYLVANIA HAS THE *FACILITIES* AND THE *CAPABILITY* TO MEET THE LARGEST POWER TRANSFORMER REQUIREMENTS

- A large, expertly-staffed engineering department with long experience in power transformer design—both core form and shell form.
- The ability to design and construct full-scale test models for proving design characteristics.
- A modernly equipped plant capable of producing and testing the highest rated units contemplated by the industry today.
- Handling and loading facilities that permit full utilization of manufacturing, shipping and installation economies.

PENNSYLVANIA TRANSFORMER DIVISION

McGraw-Edison Company

CANONSBURG, PENNSYLVANIA Greater Pittsburgh District

For Installation view, see other side

PROMOTIONAL FAN used by church-goers in Quincy, Ill., is a gift of local heating and air conditioning company. It has proved both dignified and successful

A. C. Advertising Goes to Church in Dignified 'Miniature Air Conditioner'

Utilities concerned with air conditioning promotion will be interested in this dignified church promotion by the Gem City and Air Conditioning Co of Quincy, Ill.

C. I. Richmond and W. F. Miller, the principals of Gem City, have earned the gratitude of parishoners in Quincy by their thoughtful gesture of supplying them with fans at services during the warm summer months. The fans have imprinted on one side a multi-color non-denominational religious picture. A general sales message plus an appeal to attend church are printed on the other. "Please accept this miniature air conditioner with our compliments" is spread across this side, which also contains the firm's name and address.

Reaction to the promotion has been very favorable. Gem City devised it after it had made an air conditioning installation in the Calvary Baptist Church of Quincy. The Calvary people were so pleased with the job that Miller and Richmond felt encouraged to seek leads for other church jobs.

H & C BRIEFS

Room Heaters Introduced

Westinghouse returned to the room heater business with a line of four models at the Housewares Show in Atlantic City, N. J. Featuring custom and special models, the automatic heaters are rated at 1320 w and 1650 w.

See Heat Pump Sales

Heat pump sales in southern U. S. are expected to increase sharply above their present levels by the end of 1957, according to Westinghouse Electric Corp. The company hopes to get a substantial portion of this sales increase with its split-system unit designed for counterflow applications in residences having no basements.

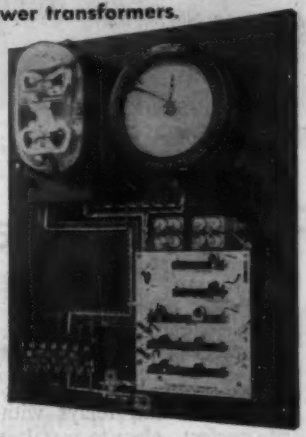
GE Shifts A.C. Production

Manufacture of room air-conditioning units has started at General Electric plant, Appliance Park, Kentucky. The Erie, Pa., plant stopped production in June.

(*More Selling on page* 116)

Transformer Loss Compensator *Saves you Money!*

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

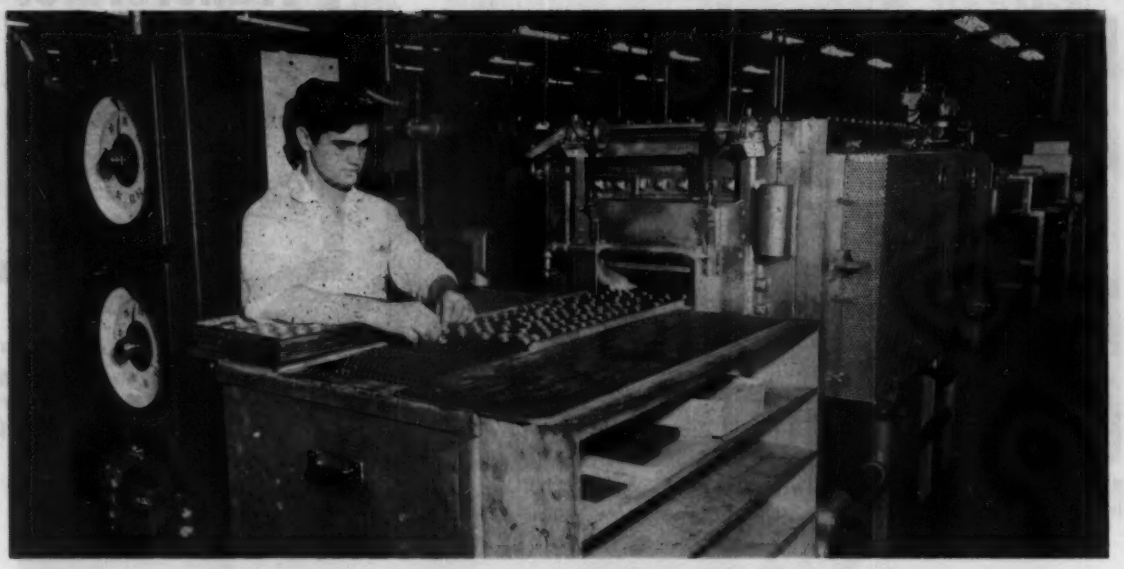
Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.

Get your book now FREE

Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.

EASTERN SPECIALTY CO.

PHILADELPHIA 40, PA.



Electric oven provides good temperature control in process where . . .

Precision Heat Is Key to Quality Product

P. C. Pokrop, Industrial Sales Engineer, The Connecticut Light & Power Co, Norwalk, Conn.

Transistors and relays with almost perfect glass-to-metal seals were put into quantity production by combining electric heat, precision electronic control, and a controlled atmosphere at the Zell Products Co, Norwalk, Conn. Used in a variety of environments, these electronic components have to meet a rigid specification calling for a seal that "will not leak in excess of one cubic centimeter of helium in 15 years under a pressure differential of one atmosphere."

A standard, 55-kw, electric heat-treating furnace was specially modified to meet the process requirements. The length of the cooling zone was doubled, a glass annealing zone was included, and a two-section heating zone for glass melting was added. Using a special heating element design, Zell developed techniques that hold glass melting temperatures within ±5 F.

To obtain maximum control, special, 60-v, non-inductive, sinuous wound nichrome heating elements are wired in series-parallel. A time clock automatically brings the oven up to working temperature so it is ready for operation when the first shift reports to work in the morning.

Fail-safe devices incorporated in the design will shut down the oven in the event of failure of water, gas, or power, as well as protecting the unit against excessive temperatures caused by equipment failure. Automatic controls regulate the flow of water in the cooling chambers and help maintain the desired temperatures. An exogas generator using city gas produces the furnace atmosphere and maintains its composition to within ±0.2% for oxygen and ±0.5% for total combustibles.

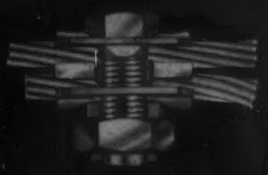
The first unit has been in use for approximately one year and has proven so successful that a second unit was recently installed. As an extra dividend, the ovens can also be used for copper brazing operations and in annealing stainless steel and other parts for electron tubes.

Electric Unit Cuts Steam Costs

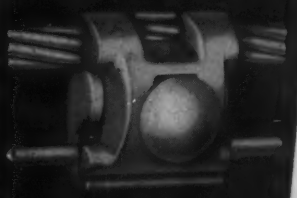
HARRY FISLER, Power Sales Engineer, Pennsylvania Power & Light Co, Harrisburg, Pa.

An economical source of steam for week-end work periods is the electric steam generator installed by C. H. Masland & Sons, a Carlisle, Penn., carpet manufacturer. It permits the expensive, high pressure conventional steam equipment to be shut down on summer week-ends when only a few looms, needed to complete special or rush orders, are operating. The compact unit takes up little floor space, has a quick heat-up, and produces substantial savings in operating expenses of the company.

Operating during off-peak electric periods, the electric generator does not increase the customer's billing total demand, although it draws a maximum of 120 amp at 550-v. The steam is used to heat sizing solution for the jute cord used in the loom shuttles. During regular work periods, the sizing is heated by steam passed through the same coils in the bottom of tanks, but generated by conventional boilers.



Type AAW



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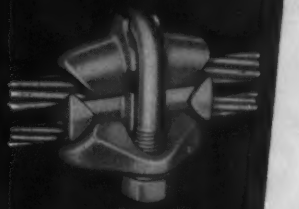
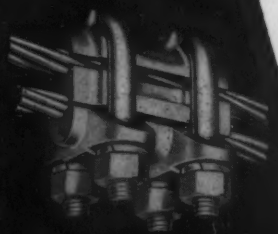


Type DLC

Type W



Type 2U AA

Type PAA 400

There's a BLACKBURN clamp for every ALUMINUM CONNECTION

Always Use Blackburn Aluminum Fittings When Terminating or Joining Aluminum Conductors

- Each clamp accommodates a wide range of conductors.
- Castings are high-strength, corrosive-resistant, heat treated aluminum alloy.
- Blackburn special surface treatment eliminates production oxides and improves conductivity.
- Bell contoured grooves protect conductors. Clamping forces are distributed over extra-large contact area.
- Available with galvanized steel or aluminum hardware. Aluminum hardware is alumilited to prevent seizing.
- Can be quickly and easily installed with regular linemen's equipment. No special tools required.

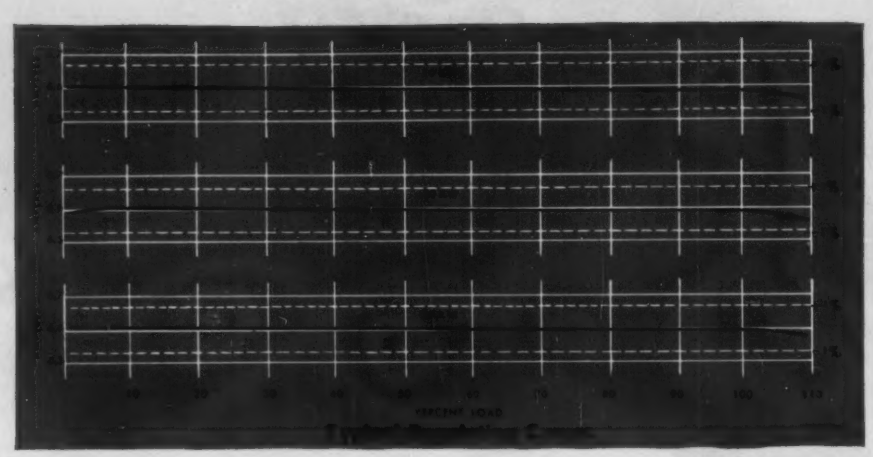
IMPORTANT: We recommend the use of CONTAX on all aluminum connections. CONTAX is an oxide inhibiting compound with an ASTM drop point of 549° F.

BLACKBURN *Aluminum* FITTINGS

JASPER BLACKBURN CORPORATION
1525 Woodson Rd., St. Louis 14, Mo.,
Wydown 3-9430

Specify MOLONEY CONSTANT..

FOR CURVES LIKE THIS...

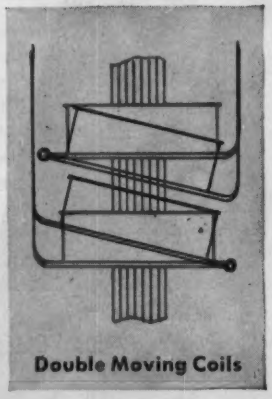


Moloney Offers A Complete Line Of Constant Current Transformers Which Provides Better Operating Performance For Your Series Street Or Highway Lighting Circuits.

Better Regulation . . . due to superior electrical design, plus Moloney's exclusive double-moving-coil construction makes Moloney Constant Current Transformers the most practical buy. A complete range of primary voltage and frequencies and secondary current ratings or multiple secondary ratings, permits a wide choice for *your* particular requirements.

Exclusive mechanical and electrical features make Moloney Constant Current Transformers the accepted choice for greater efficiency, better regulation and longer operating life.

Available in standard and special ratings conforming to ASA Standards, for Pole or Platform mounting, subway or station installation, with or without capacitors, and in completely self-protected, packaged units for fully automatic operation.



Double Moving Coils

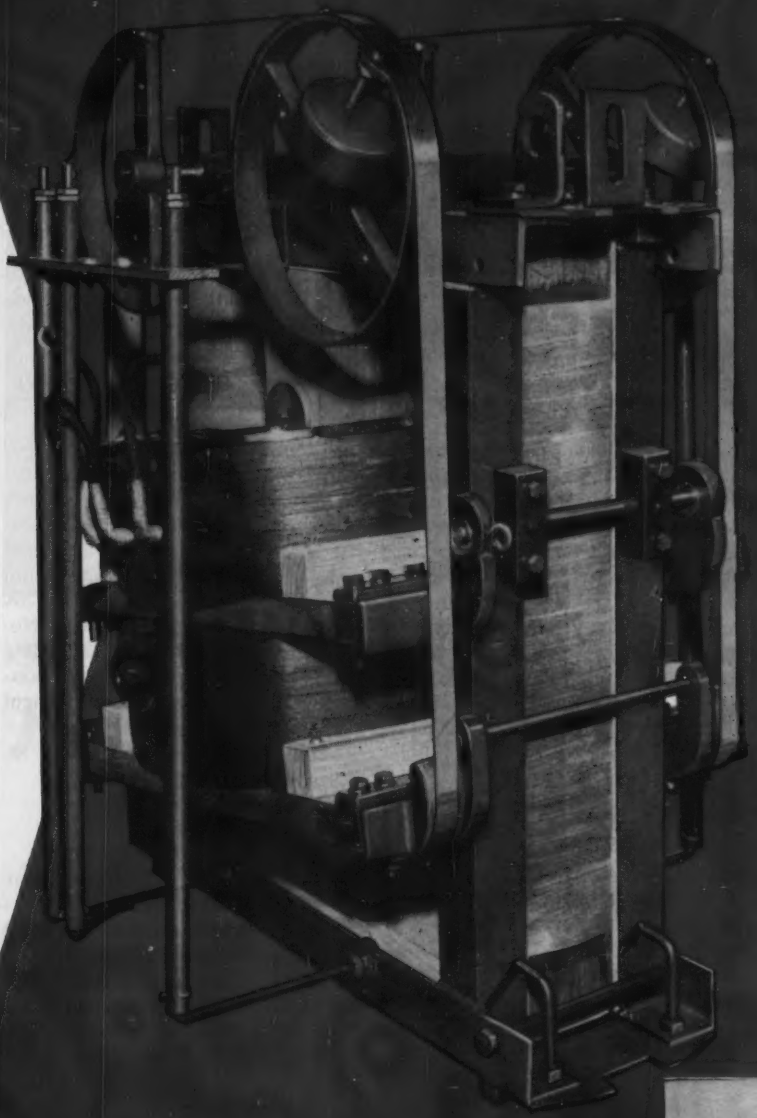
MES7-15

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

. . CURRENT TRANSFORMERS

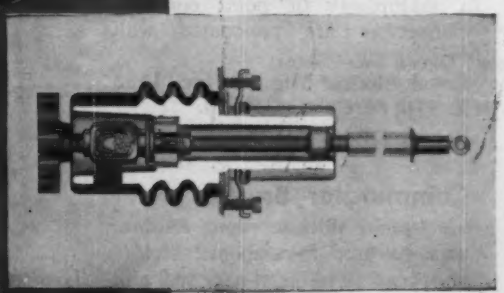


External Adjusting Handle Mechanism (Patent applied for)

Flexible Coil Leads

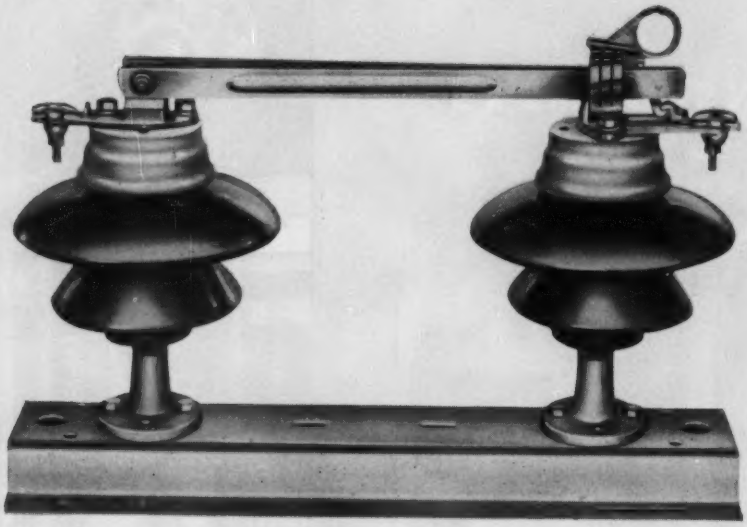
Counter Balancing Weights

Ball Bearings At Fulcrum Arm



Sidewall Bushings

MOLONEY ELECTRIC



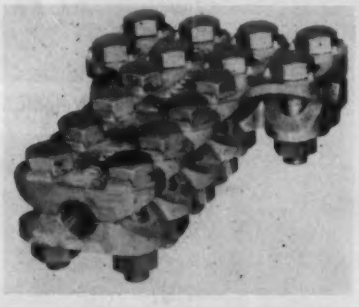
Hookstick Switch . . .

. . . mounts in vertical or underhung position, is assembled on standard duty insulators. Available in ratings of 7.5, 15, and 23 kv at 200 amp, it can be furnished with cap-and-pin and station-post insulators.

Multi-finger jaw contacts are hard-drawn copper and have phosphor-bronze back-up springs. Blade latch and centered contact pressure hold switch securely when in closed position. Pry-out action gives extra leverage for easy opening. Blade is high conductivity copper, formed into rigid truss to resist side-thrusts.
A. B. Chance Co, Centralia, Mo.

Aluminum Connectors . . .

. . . provide high contact pressure with low connector stress. Engineered for maximum strength, conductivity, and long life, they are available as a complete line, featuring heavy-series bolt design. Nested bolt heads can not turn, permitting easy, one-wrench installation. Contact surfaces are finished by grinding and machine brushing to provide a multiplicity of point contacts. Connectors are pre-coated with oxide inhibitor.



Royal Electric Mfg Co, Inc, 1122 E. 87th St, Chicago 19, Ill.

Commutator Brushes . . .

. . . resist silicone vapor erosion, may be used in seaboard motors and generators, semi-enclosed mill motors, industrial equipment operating under explosive conditions, and other silicone-insulated equipment. Type E-26 is a high contact drop grade, electrographitic brush with rugged construction and long life. The E-32 is a very high contact drop electrographitic brush for particularly severe commutating problems. They are available in either one-piece or split-type brush in wide variety of sizes and designs.
Speer Carbon Co, St. Marys, Pa.

Compression Tool . . .

. . . is only 9.5 in. long, weighs 20 oz. Operated safely and easily wherever small wrench or pliers can be used, it has a mechanical advantage as high as conventional tools two or three times as large.

To assure full compression, the UT2 Shure Squeeze releases only when action is completed.

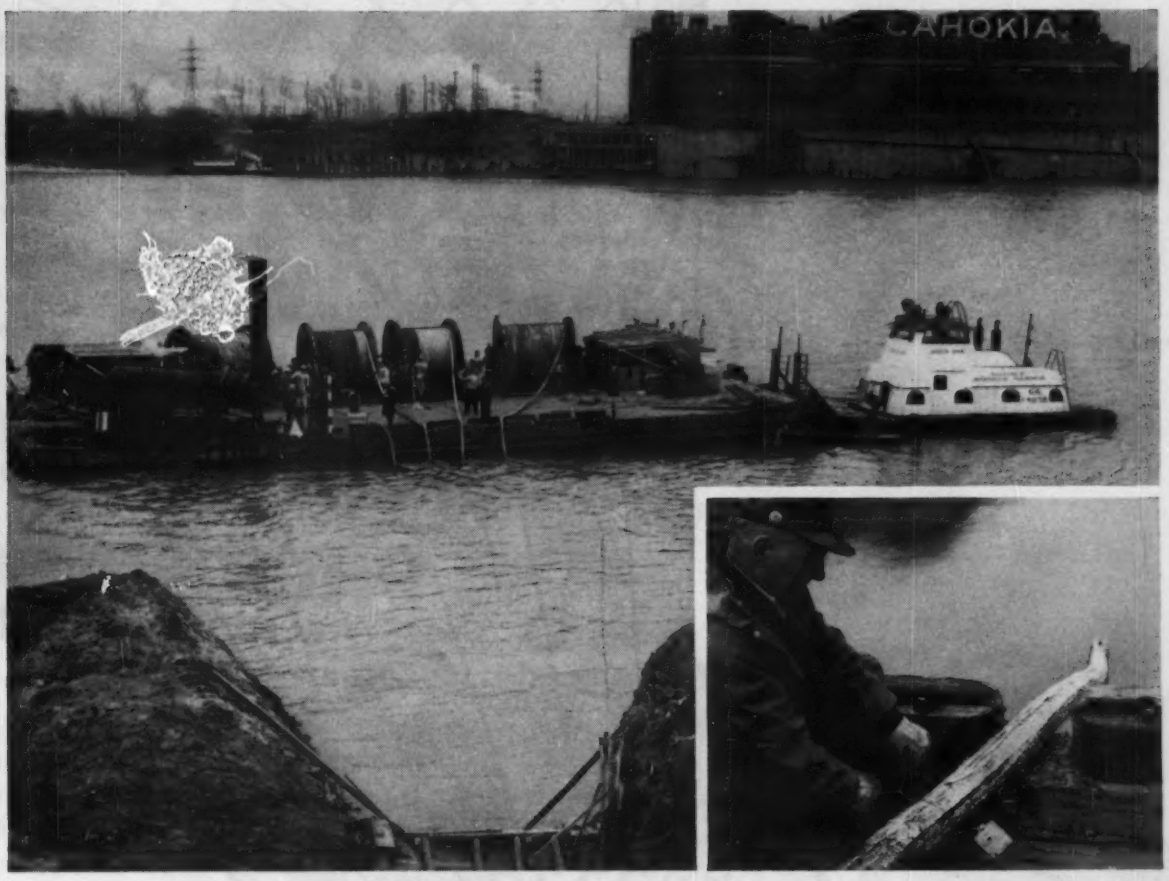
Maximum installation range is No. 1 stranded and No. 2 ACSR for house service connections or pin terminals used to terminate aluminum conductor to copper terminal facilities. For angle taps, maximum sizes are No. 2 solid or No. 4 ACSR for the main, No. 1 stranded or No. 2 ACSR for the branch. Installing die is keyed to match shape of connector, assuring positive alignment of angle tap in tool.
Thomas & Betts Co, 36 Butler St, Elizabeth, N. J.

Motor Control Centers . . .

. . . with modular starter units are available for service from one to 100 hp at 220 v ac and one to 200 hp at 600 v ac. Designated Class 11-350, they centralize all controls in one group of stationary interchangeable enclosures, each 90.375 in. high by 20 in. wide. Structures for front and back-to-back mounting of controls can be obtained in either indoor or outdoor, weather-resistant models.

Each structure has a main, horizontal, 3-phase bus and a vertical 3-phase bus to distribute power to starters. Heights of starters vary from 9.333 to 70 in., in multiples of either 14 or 9.333 in. Combination-

(*Continued on page* 124)



UNDER THE MIGHTY MISSISSIPPI

Neoprene guards Union Electric cables from galvanic corrosion, vibration and strain

In January, Union Electric Company laid four submarine cables under the Mississippi River from its Cahokia, Ill., plant to St. Louis, Mo. These lead-sheathed cables, protected with neoprene covers, lie 11 to 14 feet below the river bed.

Neoprene protective covering serves as a cushion between the steel wire armor and the lead sheath, and helps reduce galvanic corrosion of the wire armor. It reduces scoring of the lead and the effects of vibration, bending and strain. Neoprene is more resilient than other protective materials and provides an extra layer of protection for the lead sheath.

Union Electric Co. also has eight neoprene-covered lead-sheathed cables under the river at its Venice, Ill., plant farther upstream. They were put down in 1950.

These installations are another example of the accepted reliability and long life of neoprene. Of all resilient materials, only rugged neoprene has balanced resistance to sunlight and weathering, oils and chemicals, heat, flex, cracking, abrasion and cutting, oxidation and aging.

Ask your supplier about wire and cable jacketed with neoprene. It's available in single and multiple conductor types and voltage ratings to meet your requirements. Mail the coupon below to get the ELASTOMERS NOTEBOOK with actual on-the-job reports of neoprene's performance in a wide range of industrial products.

DU PONT
REG. U. S. PAT. OFF.

Better things for better living
. . . through chemistry

NEOPRENE
— made by Du Pont for 25 years

E. I. du Pont de Nemours & Co. (Inc.)
Elastomer Chemicals Dept. EW-8
Wilmington 98, Delaware

Please put my name on the mailing list for the Elastomers Notebook.

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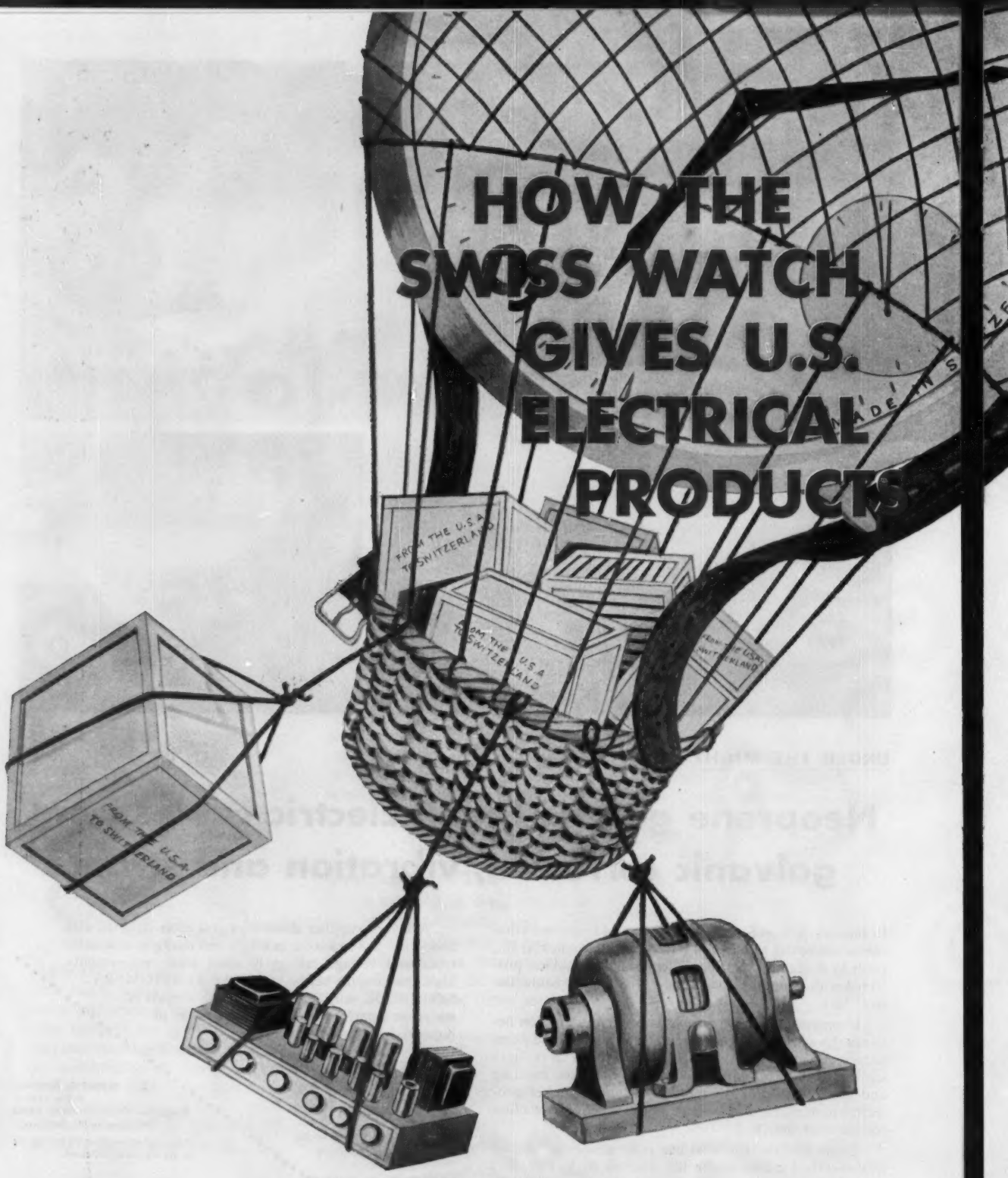
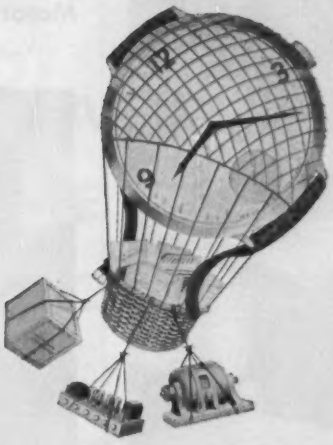
MAIL THIS COUPON NOW . . . WHILE YOU'RE THINKING ABOUT IT

HOW THE SWISS WATCH GIVES U.S. ELECTRICAL PRODUCTS





A $9,676,977 LIFT

It's a mighty magnet, that little Swiss watch.

Last year alone, it helped lift this tremendous load to the Alps: $9,676,977 worth of electric and electronic parts, radio sets, electrical apparatus, refrigerating machinery, generators, dynamos, pumps, hydraulic motors.

Switzerland, you see, is one of the most highly electrified countries in the world. Her annual electrical energy production, according to the latest figures, is 3,043 kilowatt-hours per capita; America's, 4,071. And the Swiss like to plug in electrical products "Made in America" to the electrical energy "Made in Switzerland."

How does the Swiss watch help them do it? Well, the Swiss buy American goods with the proceeds of what they sell over here. About half their sales are the products of their three-hundred-year-old watch industry. And the Swiss pay as good customers do . . . *in cash!* It's all trade. No aid.

As a matter of fact, Switzerland is America's best cash customer in Europe. A customer who has spent in America every dollar she has earned in America since 1946—plus 50% more. American business has gained a fat, favorable trade balance of $500,000,000!

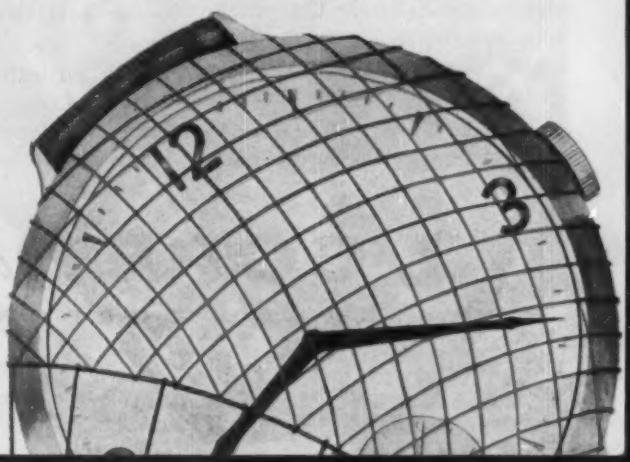
The present volume of trade between Switzerland and America was stepped up by the reciprocal trade agreements of 1936 between our two democracies. We would both be losers if anything switched it off.

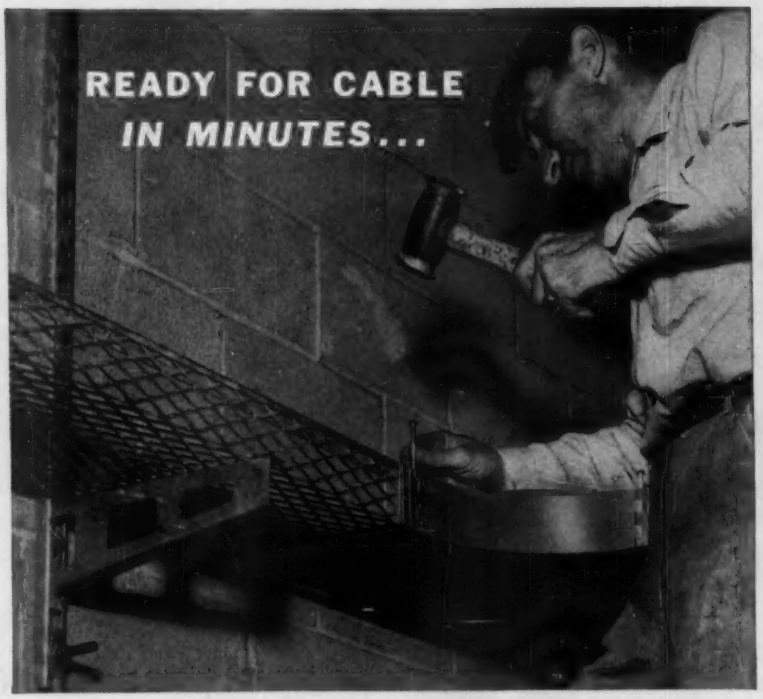
In 1954, America hiked the tariff on jeweled-lever Swiss watch imports by a huge 50%. Since then, further restrictions are being considered. And they could price the Swiss watch right off the wrists of Americans!

But the reciprocal trade between Swiss and Americans has gone on for a long time. It was brought about by men of good will and good business. Surely, today's men of good will and good business will want to prevent a short-circuit now.

Published in recognition of the 106th anniversary of The Treaty of Friendship and Commerce pledged between the people of America and the people of Switzerland

THE WATCHMAKERS OF SWITZERLAND





An aluminum coupler plate and two steel pins do the job—with Cope's patented pin-type coupler.

COPE CABLE TROUGH CUTS LABOR COSTS TO A FRACTION!

Three simple parts—an aluminum coupler plate and two steel pins—are all it takes to connect complete sections of Cope cable *trough* . . . and in less than half the time required to connect two lengths of conduit. Furthermore, because each 24" width of trough supports as much cable as *sixteen* lengths of 4" conduit, you can sometimes actually reduce labor time *and costs* by almost 60% for the complete job!

Space Saving Flexibility. Design and construction features of lightweight, easy-to-handle Cope cable supporting equipment speed installation of space saving systems—even in the most cramped quarters.

A complete line of system accessories and fittings allow for necessary changes in direction or elevation. Supporting riser elbows, trough to box connectors, and drop outs provide maximum flexibility of installation to meet system requirements . . . reduce design time up to 25% for laying out your system.

Cut Costs Three Ways. You save *three ways* when you specify Cope cable supporting systems with pin-type coupler . . . trough, ladder, or channel.

- **LOWER FIRST COST**
- **LOWER INSTALLATION COSTS**
- **LOWER SYSTEM MAINTENANCE COSTS**

Discuss these advantages for *your* installation with a qualified Cope representative—or write to T. J. Cope Division, Rome Cable Corporation, Collegeville, Pa.

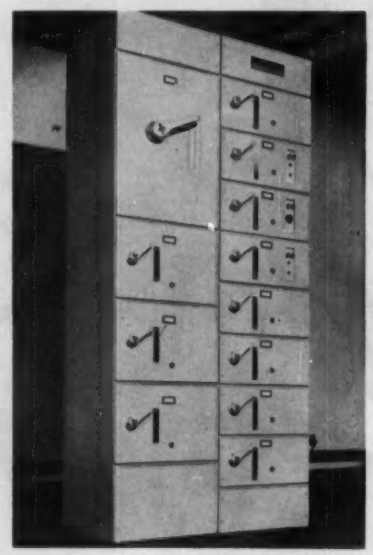
1001

T. J. COPE *Division*

ROME CABLE CORPORATION

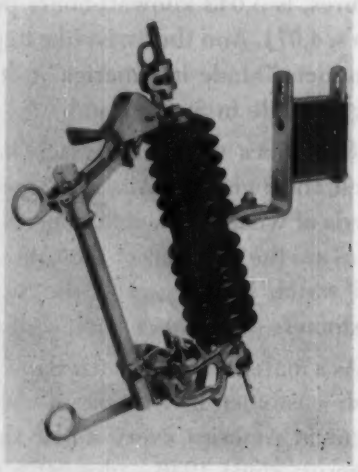
Motor Control Centers

(*Continued from page* 120)



magnetic type starters include starter and either an air circuit breaker or a fusible disconnect. Units are offered with no terminal, with individual terminal blocks on each starter, and with complete factory wiring to master terminal blocks at either top or bottom of each structure.

Westinghouse Electric Corp, Box 2099 Pittsburgh, Pa.



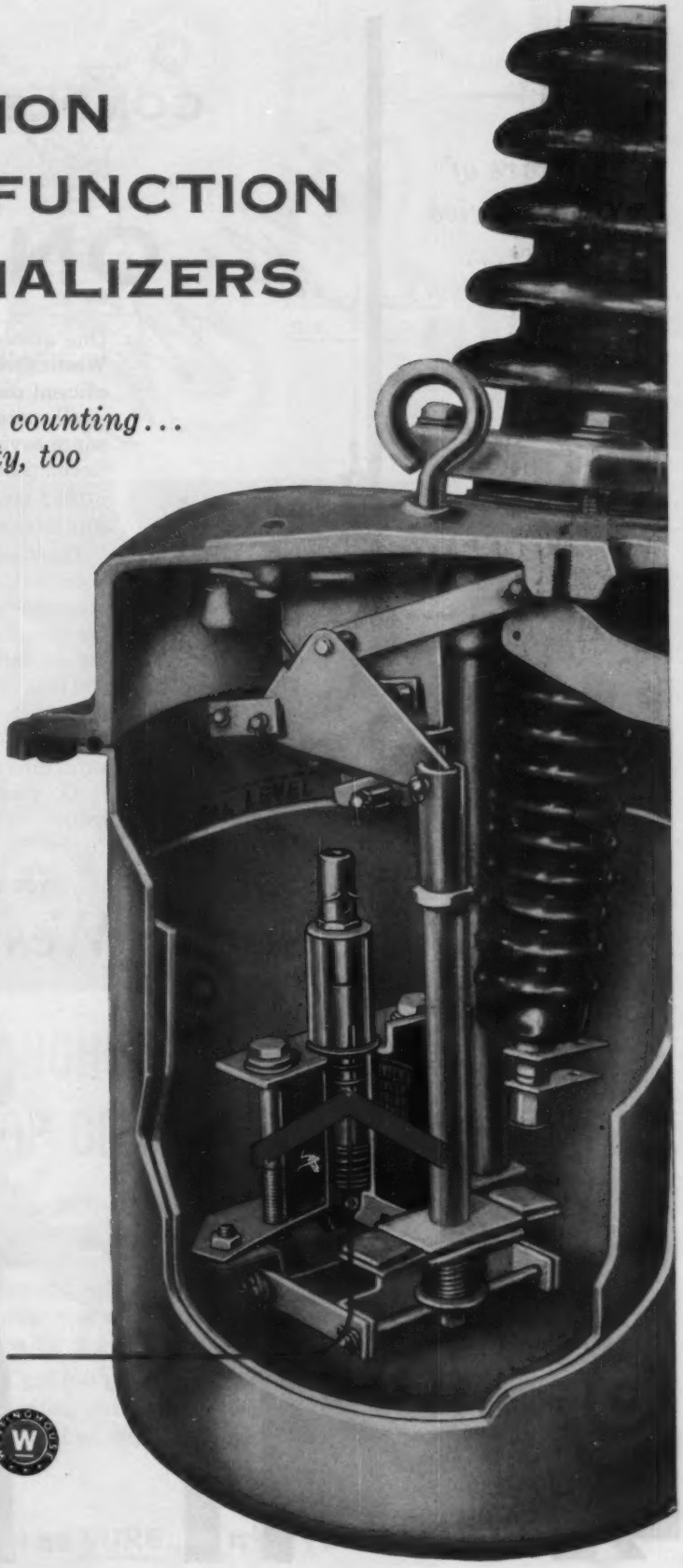
Load-Break Cutouts . . .

. . . are designed for universal button-head links in ratings through 100 amp. Voltage ratings extend from 5 to 25 kv. Type LBV-33-F

(*Continued on page* 128)

COORDINATION IS A PRIME FUNCTION OF SECTIONALIZERS

Only Westinghouse gives you absolutely precise counting... and greater current capacity, too



By definition, a sectionalizer is an automatic switch which works in conjunction with power circuit breakers and reclosers to isolate local, permanent faults and thereby protect system service continuity. Its ability to coordinate with breakers and reclosers is therefore a paramount factor in evaluation.

Westinghouse sectionalizer coordination is positive. The Westinghouse sectionalizer will carry more than 50% greater current, continuously, and will accept momentary leads up to 6500 amperes. The Westinghouse Type GRS line is the most complete—nine current steps from 5 through 140 amperes—and voltage ratings to 15 kv.

Complete details are available from your Westinghouse sales representative. Also, you may write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania, for reprint No. 5090, an application and engineering AIEE paper on sectionalizer coordination concepts. J-60923

Consistent and accurate counting is assured by the patented magnetic rings in the integrator mechanism. During operation, the brass integrator piston is locked in each counting position by the magnet plate on top of the series coil.

YOU CAN BE SURE...IF IT'S

Westinghouse

1612 years of fail-free service prove...

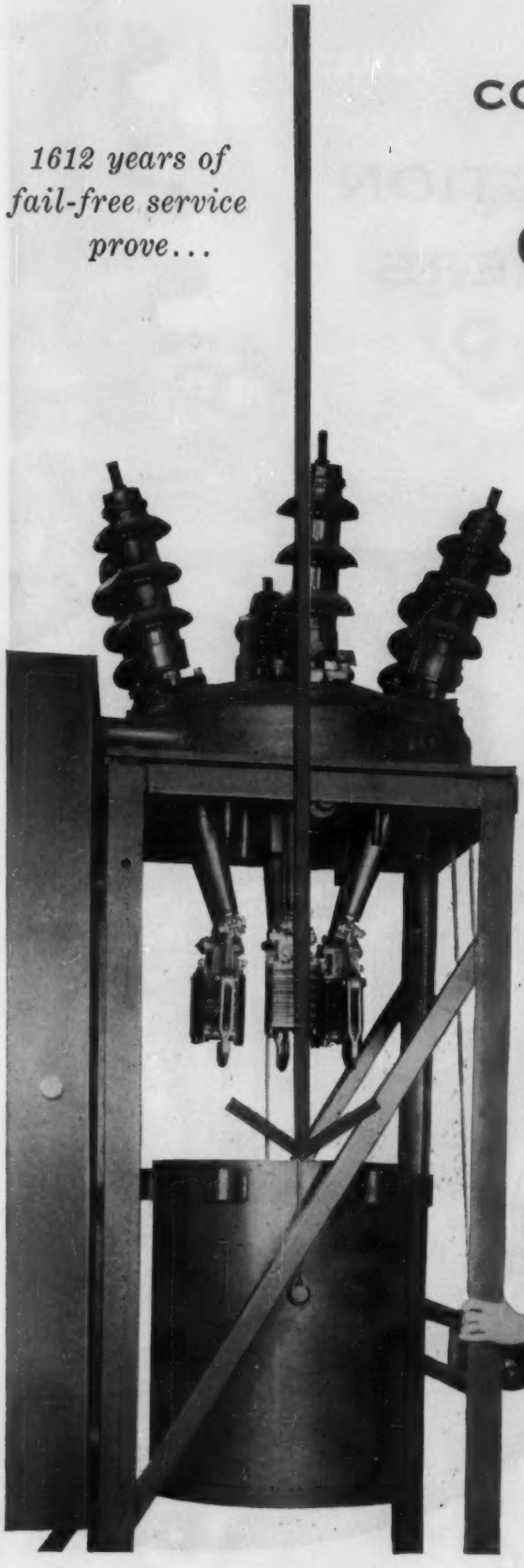
COMPLETE THREE-POLE PROTECTION IN ONE TANK

One answer to rising maintenance costs is the Westinghouse single-tank Type G breaker. More efficient use of oil, reduced maintenance hours and small space requirements add up to major maintenance savings. There are only two adjustments—mechanism stop and travel stop.

1612 breaker-years of service without failure assure this economy without compromise on protection.

The Westinghouse single-tank Type G breaker has a single De-ion® grid per phase—with exclusive Westinghouse design to shorten arc length and arcing time. Interrupting time is five cycles. Interrupting capacity is 100 or 250 mva at 14.4 kv—and 250 mva at 23 kv.

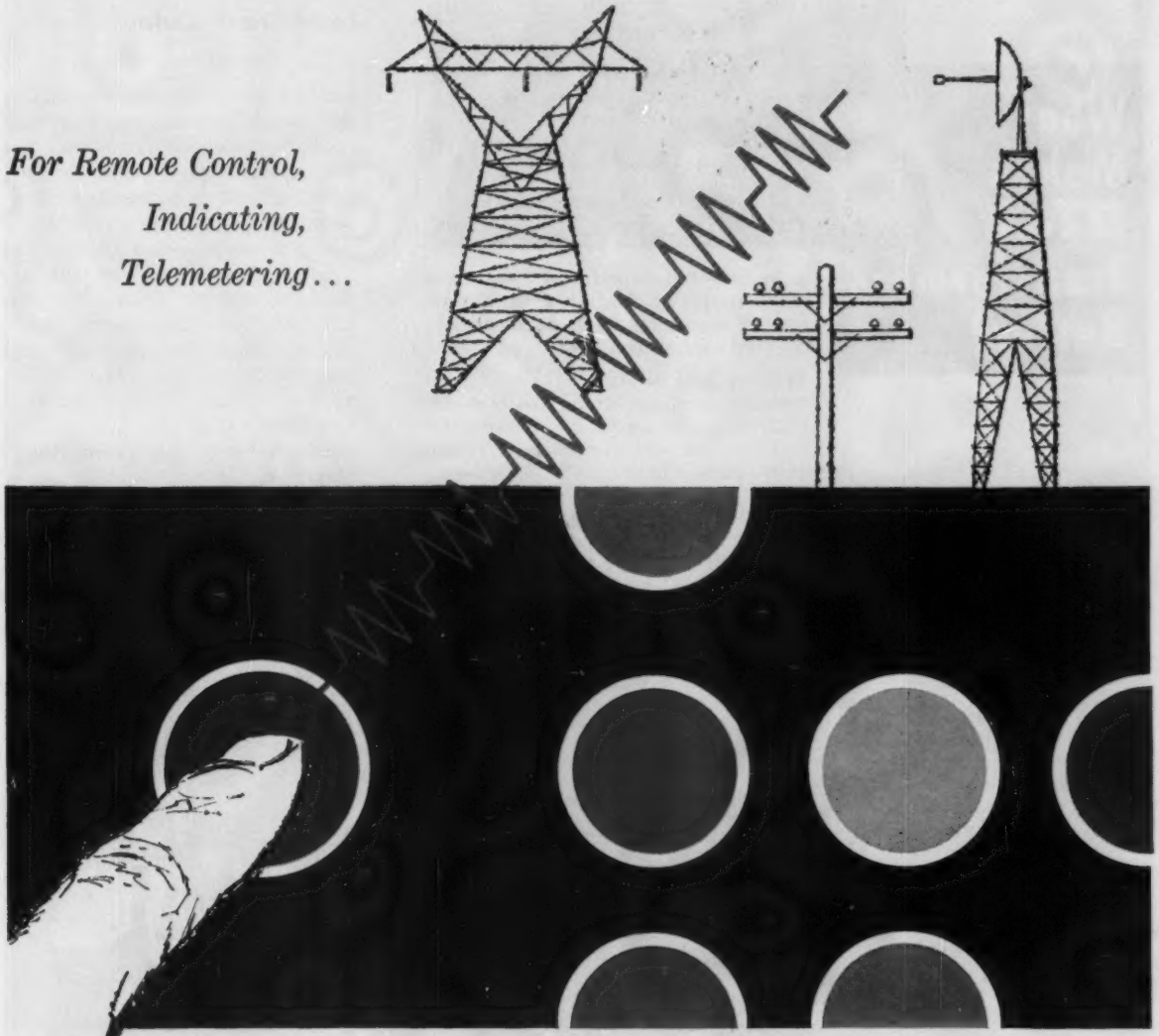
Complete details are available from your Westinghouse sales representative—or you may write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania, requesting booklet B-5834. J-00927



YOU CAN BE SURE...IF IT'S

Westinghouse

For Remote Control,
Indicating,
Telemetering...



WESTINGHOUSE SUPERVISORY SYSTEMS ...TOP DEPENDABILITY AND ECONOMY

Westinghouse built the *first* supervisory system thirty-five years ago—and it's still in everyday dependable service. Westinghouse has developed and built systems of every type, and today, as always, builds systems which excell in reliability and efficiency. They simplify your control communications and cut your operating costs by using inexpensive narrow-band channels instead of voice channels—on wire lines, power line carrier or microwave.

You can get full particulars from your Westinghouse sales representative ... or by writing direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., requesting descriptive bulletin 32-450 and reprint 4569.

J-00928

YOU CAN BE SURE...IF IT'S Westinghouse

What Makes RT&E Transformers Better?

EXCLUSIVE WOUND-CORE CONSTRUCTION

Low Iron Losses—Low Exciting Currents

A method developed and used exclusively by RT&E forms the transformer core of non-aging, high permeability, cold-reduced, silicon steel strip.

This method produces RT&E's light, compact core, combining the best core features — low losses, low exciting currents, permanent characteristics and quiet operation.

Core is of uniform thickness throughout its entire magnetic length.
Single turn laminations are staggered butt-jointed and lap secured on either side
Free of joint bulges

RT&E Transformers are submitted to the most exacting tests, to approximate 150% of NEMA full wave withstand values. They are backed by a five year guarantee.

RT&E CORPORATION
WAUKESHA, WISCONSIN

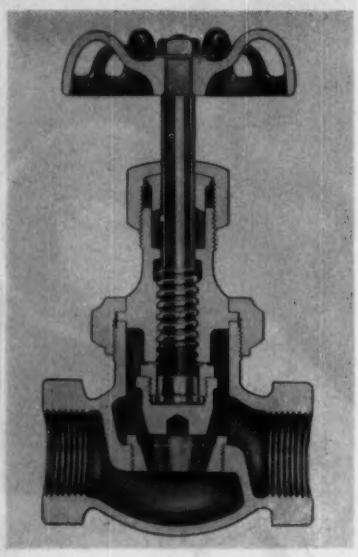
EXCLUSIVE WOUND-CORE CONSTRUCTION—Another reason why RT&E is better!

Load-Break Cutouts

(*Continued from page* 124)

has fuse holder cap with expendable disc which confines gases on low faults for dependable operation, but is expelled on high faults, allowing cutout to vent at both ends for high interrupting capacity. Type LSV-33-F, a single-vented cutout, has solid cap instead of cap with expendable disc but is identical with LBV-33-F in other respects. Interrupting ratings run as high as 8,000 amp rms for the LBV-33-F and up to 5,000 amp rms for the type LSV-33-F.

Southern States Equipment Corp, Hampton, Ga.



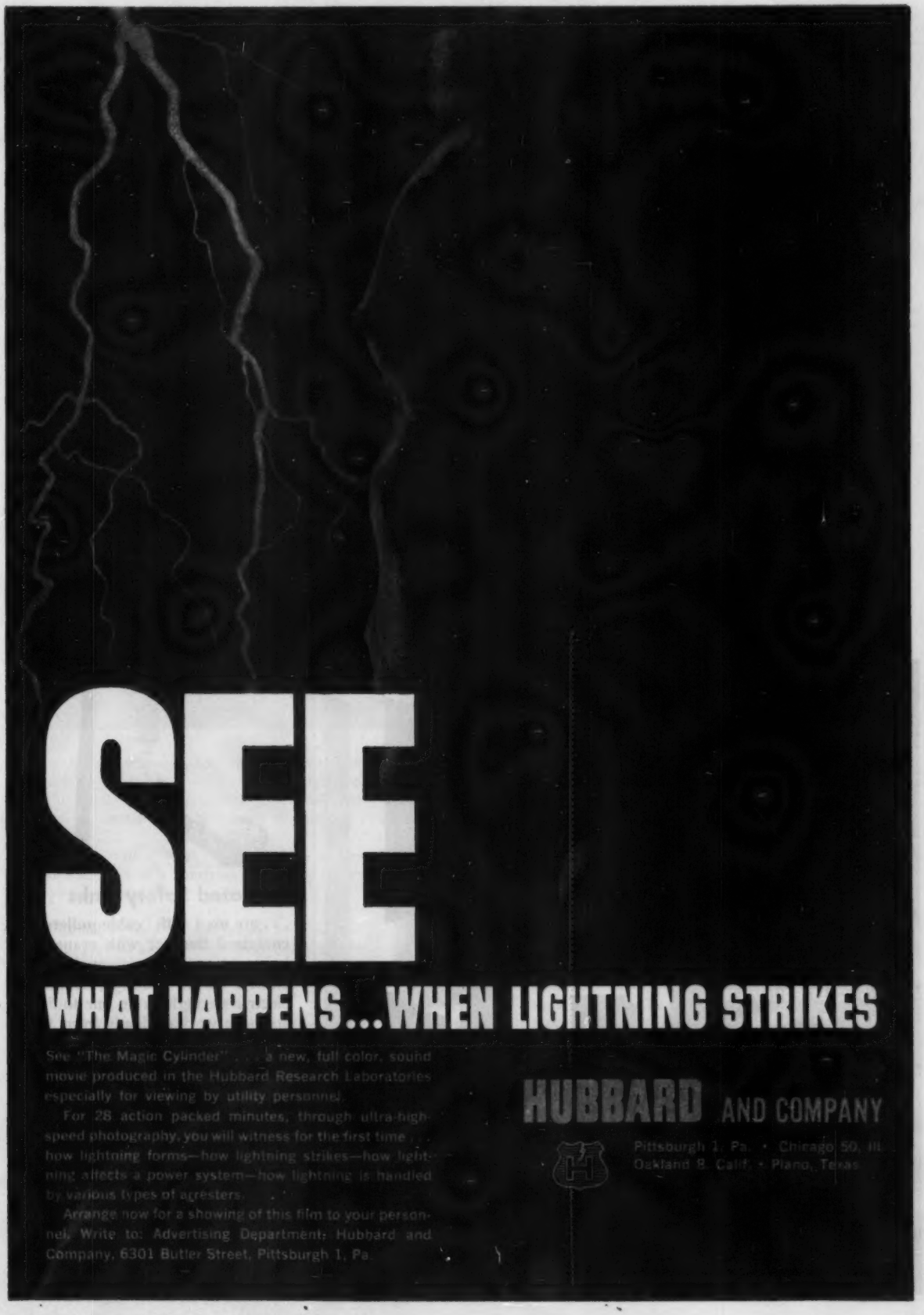
Plug Type Valves . . .

. . . **have hardened stainless steel seats and discs** rated more than 500 Brinell. Available in globe and angle style for 150 and 200-lb working steam pressure classes, they can be used for close throttling of steam, water, air, or oil. They are designed for use where frequent operation causes excessive wear to ordinary materials or where corrosive service affects closure surfaces.

Sizes range from 0.25-in. to 2 in. Valves have union bonnet for added strength at centerpiece joint. Seat and disc are renewable.

Ohio Brass, Mansfield, Ohio

(*More New Equipment on page* 130)



SEE

WHAT HAPPENS...WHEN LIGHTNING STRIKES

See "The Magic Cylinder" . . . a new, full color, sound movie produced in the Hubbard Research Laboratories especially for viewing by utility personnel.

For 28 action packed minutes, through ultra-high-speed photography, you will witness for the first time . . . how lightning forms—how lightning strikes—how lightning affects a power system—how lightning is handled by various types of agresters.

Arrange now for a showing of this film to your personnel. Write to: Advertising Department, Hubbard and Company, 6301 Butler Street, Pittsburgh 1, Pa.

HUBBARD AND COMPANY

Pittsburgh 1, Pa. • Chicago 50, Ill.
Oakland 8, Calif. • Plano, Texas

Just the right capacity for line work...

develops 1500 watts; weighs only 125 pounds; 4-cycle engine power

This workman is drilling holes in a cross arm with power from an Onan 105AK. Unit can also be removed from truck and easily carried to where it's needed.

Onan Model 105AK-1P Electric Plant

This power-packed lightweight plant supplies all the power you need for electric drills, saws and other equipment . . . and for floodlighting on night jobs, too!

Quick-starting, 4-cycle Onan air-cooled engine is direct-connected to Onan all-climate generator in a single, permanently-aligned compact unit.

Four plug-in receptacles, pilot light and carrying frame are standard. Other lightweight portable and mobile Onan plants from 500 to 10,000 watts.

To save time and speed work on construction and maintenance projects, equip your crews with Onan Portable Electric Plants.

Call your Onan distributor or write . . .

Onan ELECTRIC PLANTS

D. W. ONAN & SONS INC.

2983 University Ave. S.E., Minneapolis 14, Minnesota

Look to Superior for

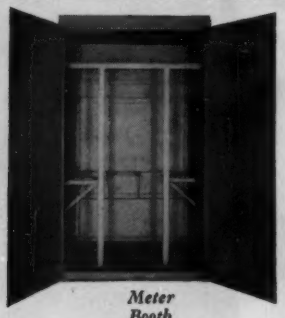
ENCLOSURES

Superior also offers a complete line of

TEST SWITCHES
TEST BLOCKS
SOCKET EQUIPMENT
TEST TABLES

Catalog 55 offers complete information on features, services, types and sizes. Write to:

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of The Union Metal Manufacturing Company



Meter Booth

Current Transformer Enclosure

Double Door Enclosure

Ceramic Fiber Insulation . . .

. . . withstands temperatures in excess of 2,000 F. This aluminum silicate material is available as roving, yarn, cord, rope, woven tape, broadwoven fabrics, and other forms in weights from 15 to 74 oz per sq yd. They may be inserted with stainless steel or nickel-chrome alloy wire for greater tensile strength.

Roving and yarn are available in size ranges from 600 to 1,000 yd per lb. Material may be used for insulating blankets and wrappings, protective clothing, gaskets, and various types of heat and flame barriers.

The Carborundum Co, Niagara Falls, N. Y.

Insulated Safety Links . . .

. . . are used with "cable pullers" on energized lines or with cranes and hoists to protect personnel against electric shock. Ratings include dielectric strengths from one to 50 kv and safe working loads from ½ to 25 tons.

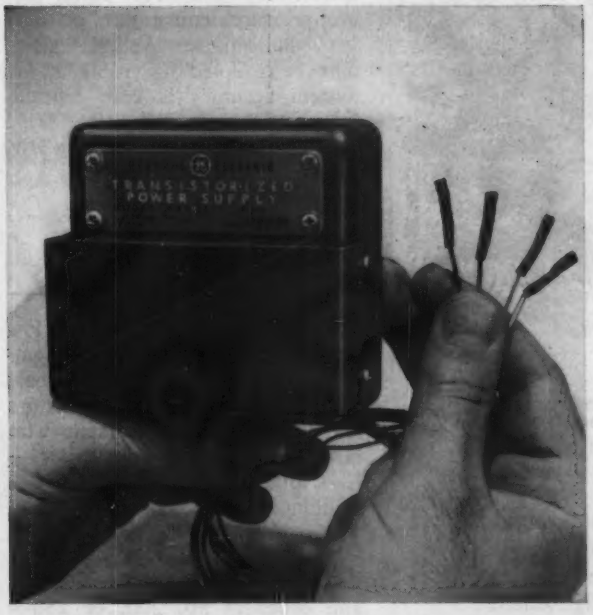
Larger sizes have two-piece steel core suspended in phenolic centerpiece and wrapped in epoxy saturated fiber glass. Smaller sizes are plastic with steel insert at each end for attaching hook or bail. Links may also isolate weldments suspended for electric welding.

E. D. Bullard Co, 2680 Bridgeway, Sausalito, Cal.

(*More New Equipment on page* 132)

General Electric announces

New transistorized power supply for two-way radio



General Electric now brings you the vastly improved reliability of transistors — *without obsoleting your present equipment!*

The all-new General Electric Transistorized Power Supply—part of G.E.'s advanced Progress Line—replaces the receiver portion of the mobile power supply and eliminates the receiver vibrator.

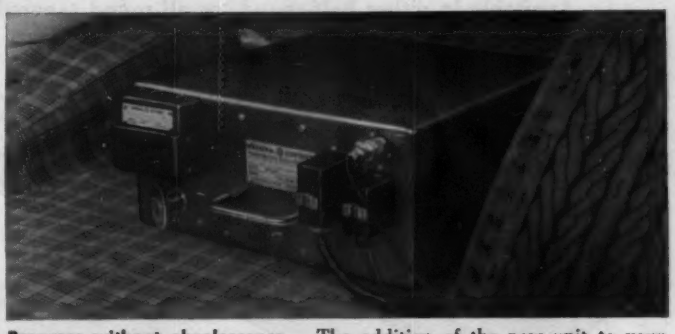
Here's what this means: Previously you had to replace receiver vibrators several times a year. Our surveys indicate each replacement costs you from $10 to $18, depending upon service call mileage. Now you can install a power supply costing only $54.50 (when installed in new equipment at the factory, just $44.50) which has the same life expectancy as your entire mobile combination. *The new G-E Transistorized Power Supply will easily pay for itself the first year or two on vibrator replacements and service calls!*

Easy to install—Three mounting studs fasten the new unit to the front of your case or inside the older, two-unit design equipment. Electrical connections are simple: only four leads to attach.

Eliminates "Vibrator Hash" — All traces of the "vibrator hash" which interferes with clear reception are gone for good.

Easily added to any 12-volt system — The new power supply can be used with all standard makes of two-way equipment which operate from an ordinary 12-volt power source.

Saves you money when drivers forget—When drivers neglect to turn off their radios before starting a vehicle, the new transistorized power supply cannot be damaged.



Progress without obsolescence — The addition of the new unit to your present mobiles, no matter what make, improves performance, reduces maintenance cost, and adds to the life of your equipment. *There is absolutely no need to buy complete new mobile units to enjoy the advantages of transistors.*

2-WAY MOBILE RADIO

See for yourself how much you save—buy a new unit or several units and try them in your own 12-volt mobile units. Call your G-E communications consultant, listed under "Radio Communication Equipment" in the Yellow Pages. Or order direct by writing General Electric Co., Communication Products Dept., Syracuse, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

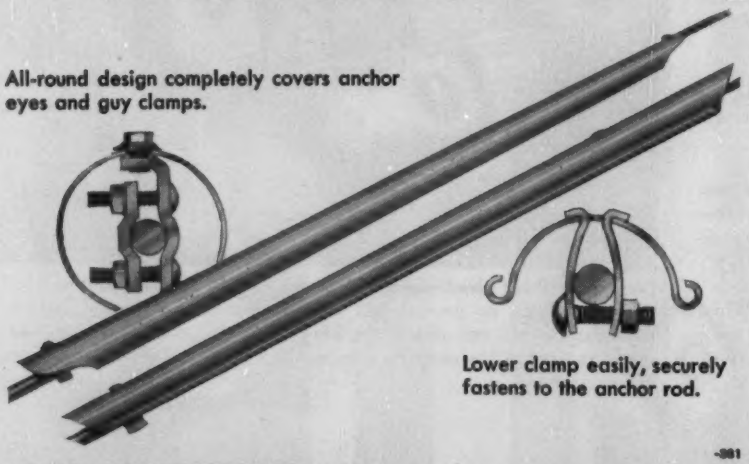
fast, easy installation
...won't turn on strand

KEARNEY
Full-Vu
Guy Guards

They install fast, and stay up permanently... guarding against accidents with the brightness of aluminum alloy, day and night.

High strength (equal to steel) and light weight (⅓ that of steel) of KEARNEY Full-Vu Guy Guards make installation easy and economical. Guard clamps will not turn on strands once they are tightened. Available in either half-round, or all-round tapered style, in seven and eight feet lengths.

All-round design completely covers anchor eyes and guy clamps.



Lower clamp easily, securely fastens to the anchor rod.

-881

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Remote Valve Control . . .

. . . **shows valve position on meter face,** with color-coded segments at each end of scale to indicate upper and lower valve limit positions. Called the Val-Con, it operates over leased lines or standard 2-wire and ground systems and can be used with motor controllers over distances from a few feet to many miles. Two independent, visual alarms may be used for power failure, pressure, temperature, or overload indications. Audible alarm may be coupled to visible alarm. System accuracy is 2%; repeatability, 0.5%; sensitivity, 0.25%. **Sparton Corp, Controls System Div, Jackson, Mich.**

MORE NEW PRODUCTS

Fluorine polymer **spray** has low loss dielectric properties, high chemical resistance. Packaged in aerosol containers, it is used for moisture sealing and coating magnetic wire insulation, resistors, or bus bars.—E. I. du Pont de Nemours & Co, Wilmington, Del.

Tri-Heat **3-way infra-red heat lamp** fits any standard 3-way socket and produces 50, 200, or 250-w output from 110 to 125-v line—Laine Electronics and Mfg Co, Little Ferry, N. J.

Big Beam car flash **warning light** plugs into 6 or 12-v systems, flashes 72 times per minute. It can operate overnight without running down battery—U-C-Lite Mfg Co, 176 W. Adams St, Chicago 22, Ill.

Circulating and coolant pumps for sidewall or immersion mounting, in ranges from ¼ to 5 hp, require no stuffing boxes, pump bearings or couplings—Ingersoll Rand, 11 Broadway, New York 4, N. Y.

Cab and chassis truck with 123-inch wheelbase is offered as ½-ton tool and equipment carrier—Chevrolet Motors Div, Detroit 2, Mich.

Two solventless, silicone **insulating resins** can be used for void-free encapsulations for electric and electronic equipment.—Dow Corning Corp, Midland, Mich.

BOOKS

Books Received Since May 22, 1957

A Second Course in Electricity. By A. E. E. McKenzie. Published by Cambridge University Press, 32 East 57th Street, New York 22, N. Y. 809 pages, illustrated. Price $3.50.

Electrical Construction Materials List, May 1957. Published by Underwriters' Laboratories, Inc. 411 pages.

Hazardous Location Equipment List, May 1957. Published by Underwriters' Laboratories, Inc. 98 pages.

Electrical Appliance and Utilization Equipment List, May 1957. Published by Underwriters' Laboratories, Inc. 369 pages.

Transistor Circuit Engineering. By Richard F. Shea. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 432 pages, illustrated. Price $12.00.

Introduction to Electrical Applied Physics. By N. F. Astbury. Published by Philosophical Library, Inc., 15 E. 40th Street, New York 16, N. Y. 234 pages, illustrated. Price $10.00.

Engineering Electronics with Industrial Applications and Control. By John D. Ryder. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 36, N. Y. 655 pages, illustrated. Price $9.50.

Fundamentals of Electricity

Electricity and Magnetism. By J. Newton. Published by Philosophical Library, New York, N. Y. 613 pages, illustrated. Price $10.00.

Starting with two introductory chapters on electrostatics and magnetism the author presents a very extensive treatment on the field of electricity and magnetism. Electric current, resistance, electrolysis, electromagnetism, electrodynamics, capacitance, and alternating current machines are some of the many topics covered.

In presenting the fundamentals the author usually treats them from an historical point of view. He discusses the scientist involved, the time and the circumstances of the discovery. The author also presents illustrations of the devices used by these pioneers to demonstrate the fundamental under discussion.

In addition to the topics traditionally presented in a textbook of this sort, the book has material on the physics of the atom, cathode ray tubes, and the metric-kilogram-second system of units. The last topic is presented in a logical order. The need is first discussed and then the development of the system is presented together with its relationship to other systems of measurement.

The book is well illustrated. Problems on the topics discussed are given at the end of each chapter—with answers in the back of the book.

One squeeze of a pair of pliers . . . and strand ends are served in ¼ of the time needed when using waste strand. KEARNEY Guy Wire Clips will not damage strand galvanizing. The clip, half-formed, slips on guy wire and end. The job is neat, permanent . . . time-saving. Specify KEARNEY Guy Wire Clips, available in six sizes of aluminum and galvanized iron.

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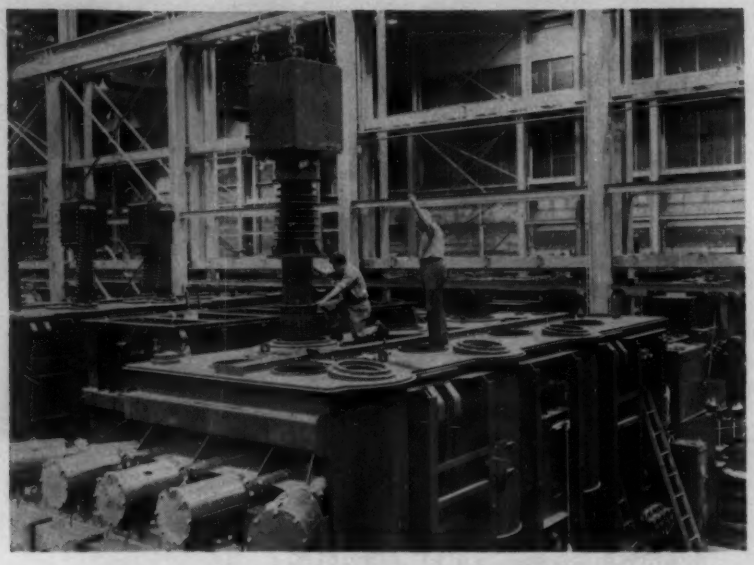


G-E's LTC Mechanism Built on Bushing

Bushing-mounted load-tap-changing (LTC) mechanisms have been designed to make high-voltage load tap changes on two 125,000-kva autotransformers. They are reported to be the largest built to date in this country and were shipped recently by General Electric Co's Power Transformer Department at Pittsfield, Mass. The LTC mechanisms will be installed at Niagara Mohawk Power Corp's Gardenville station to tie 230- and 120-kv lines.

By using this new development, G-E engineers report, the LTC equipment can be placed on the high-voltage winding of a transformer without the need of a series transformer. In the illustration G-E workmen are shown installing a 120-kv bushing with LTC contactors on top. Advantages of eliminating the series transformer are reduced size, weight, losses, and reactance—making one-piece, upright shipment, easier installation, and more efficient operation.

The contactors are mounted in their own oil-filled tanks on top of the separate oil-filled porcelain bushings. This feature is uniquely adaptable to autotransformers because the same bushing which supports the contactor can also serve as line bushing. Oil carbonized by arcing is confined to the contactor tank and is not a part of the insulation to ground.

Tap selector is mounted in the transformer tank near the windings, allowing short high-voltage lead connections. Both contactor and tap selector are connected by Herkolite insulating shafts to a motor drive mounted on the end of the transformer tank.

Use of this type LTC design, G-E engineers said, will also prevent the voltage from varying in the delta-connected tertiary, making tertiary capacity available for external loading. In addition, flatter impedance characteristics from maximum raise to lower position are possible with this design.

An even larger bushing-mounted load-tap changing power transformer, rated 200 Mva, is now on order, according to G-E officials, with completion scheduled for 1958.

Duke's Allen Units To Have Wheeler Circulator Pumps

A pump recently completed and tested by C. H. Wheeler Mfg Co, Philadelphia, is a 48-in. by 54-in. pull-out type vertical mixed flow circulating water pump.

Although pumps of larger capacity have been tested, this one is the heaviest to date. Pump and motor weigh about 70,000 lb while the addition of water increases total weight to over 100,000 lb. The pump column from suction bell to base plate is 36 ft 4 in.

Two circulating water pumps are to be used with Duke Power Co's Allen Unit No. 1. Identical units will be furnished for Allen Unit No. 2. The 46,000 gpm circulators will supply water to 105,000-sq ft Wheeler condensers.

Wire Rope Carries Communication Lines

Wire rope with electrical conductors imbedded in the core is produced by Leschen Wire Rope Division of H. K. Porter Co, Inc, St. Louis.

This type of rope is primarily provided for use in hoisting service communications. With the imbedded conductor in the hoist cable, communication between the moving cage or skip and hoisting engineer is simplified.

Recent order was to supply a 2,700-ft shaft rope of 2-in. Lescher flattened strand for use in a copper mine. The cable was made with 3-strand 16-wire No. 34 AWG copper for 600-v service around a nylon center with polyvinyl chloride plastic jacket. These electrical conductors were placed in the fiber core of the rope.

General Cable Joins in Venezuela Operation

General Cable Co and General Tire & Rubber Co will team up with an Italian firm, CEAT of Turin, to form a Venezuelan company which will build a factory in Valencia, Venezuela.

The companies will invest 12 million bolivars (one bolivar is about 30¢) to cover the cost of the initial operation. The company, CEAT General Industria Nacional de Cables Electricos y Telefonicos C.A., will produce electric and tele-

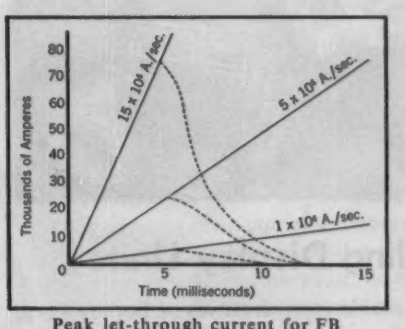
(*Continued on page* 136)

D-C CIRCUIT BREAKERS

Type FB-20 single pole circuit breaker; 2000 amperes continuous, 1000 volts d-c.

NEW "FB" CURRENT LIMITING CIRCUIT BREAKER

Now...complete current limiting protection against fault currents of 1000 to 150,000 amperes



Peak let-through current for FB circuit breaker with 1000 ampere trip.

Small in size, these FB d-c circuit breakers with fast current limiting action provide a tremendous protective capacity. In the event of a fault, powerful springs open the contacts before the current has a chance to rise to its maximum potential.

Even in circuits where the rate of rise might approach 15,000,000 amperes per second, let-through current will not exceed 80,000 amperes. In most applications, it will never exceed 30,000 amperes—and total interrupting time is only 12 milliseconds. This quick action reduces the magnitude and duration of fault currents—thus eliminating mechanical failures and heat damage.

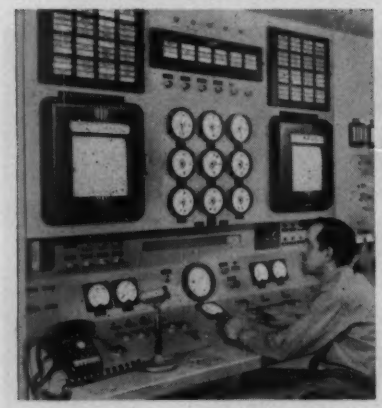
FB circuit breakers are available in either single or double pole models and with continuous current ratings of 1200, 2000, 3000 and 5000 amperes and up to 1000 volts d-c. They are available with either stationary or drawout mounting. Write for Bulletin 3004-A. I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

IN CANADA: EASTERN POWER DEVICES LTD.

Continued from page 28

The EBWR Installation



Rod position is controlled manually from the central operating console. L&N Speedomax instruments chart neutron activity at all reactor power levels for the guidance of operators.

Leeds & Northrup Company. This equipment represents the basic approach Leeds & Northrup takes to instrumentation for nuclear power generation and distribution—standardized components, systematized by engineers who have both nuclear and electric power control experience.

The EBWR system includes equipment to monitor, measure, and record all critical plant parameters, and an all-electric three-element feedwater control. Data on neutron flux is fed to Speedomax® recorders mounted at the central operating console. Reactor power level is regulated manually from the console.

The three-element feedwater system controls the flow of water into the reactor to hold level at a fixed point. With any change in steaming rate, feedwater flow is regulated from the level control and is trimmed from steam flow.

Radioactivity is monitored by a multiple-point Speedomax recorder. If activity exceeds set limits, the reactor "scrams" and the EBWR building is automatically sealed. Fifteen plant conditions must be "safe" for reactor operation.

To learn how L&N engineers can assist you with your own nuclear power project, contact *Leeds & Northrup Co., 4938 Stenton Ave., Phila. 44, Pa.*

General Cable

(*Continued from page* 134)

phone wires and cables. It expects to be in production in first quarter of 1958.

CEAT General will be the second cable plant set up in Venezuela with U. S. capital. Alambres y Cables Venezolanos, C.A., owned one third by Phelps Dodge Copper Products Corp and two thirds by Venezuelans, has started manufacturing plastic-coated wires and cables.

Westinghouse Ships By Three-Part Railroad Car

First shipment by its three-section railroad car of a 394,000-lb, 200-Mva transformer has been made recently by Westinghouse Electric Corp to Ohio Power Co's Foster, W. Va., station. (EW, Mar. 25, 1957, p. 132)

This car designed and owned by Westinghouse for shipping large power transformers is comprised of two identical sections. Each is about 30 ft long and consists of a steel framework, underframe, and wheel trucks. The transformer, comprising the third section, is suspended between the two parts. Car length with this transformer was 92 ft. For the return trip, the end "halves" will be hooked together.

Main advantage reported of this new car is that the transformer can be lowered to within 6 in. of the rails. Also installation costs and delivery time will be reduced as units weighing up to 500,000 lb can be shipped as a single piece.

When completely assembled, the transformer will stand 29 ft high, 30 ft long, and 21 ft wide. The 330-kv unit, equipped with forced oil-air coolers is scheduled for operation by Sept. 1 of this year.

IT&T Opens Laboratory

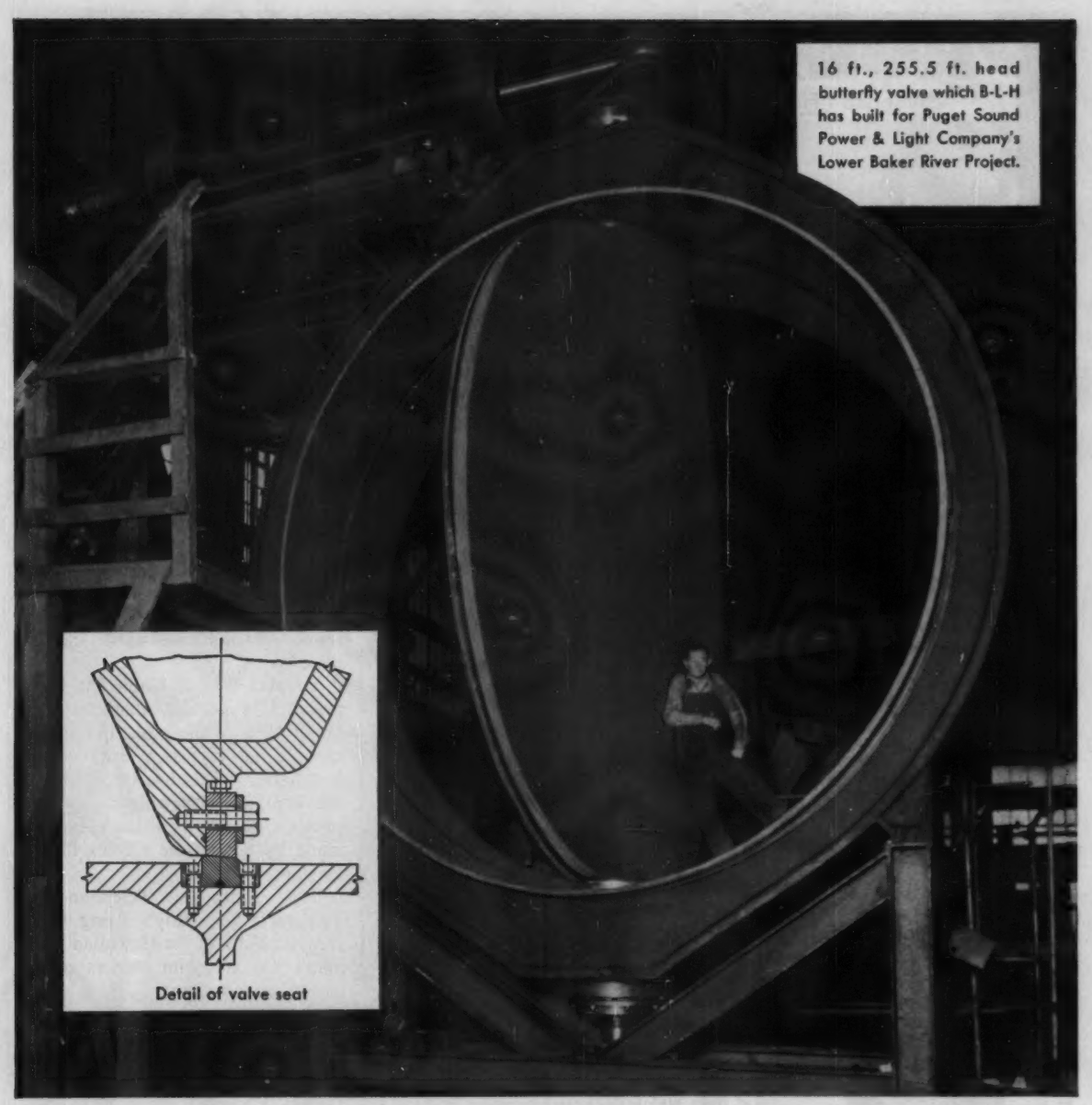
The International Telephone & Telegraph Corp Standards Laboratory has been opened in Clifton N. J. Equipped for testing and certifying master mechanical and measuring devices, the laboratory will supplement the National Bureau of Standards in providing this service to organizations, it is reported.

(*More M & M on page* 138)

Burndy Adds Traveling Display Units

Traveling display units will now enable representatives of Burndy Corp, Norwalk, Conn., to demonstrate a close-up view of connection techniques.

Units will be carried in two station wagons, starting this week, and shown to utility and industrial plant electrical personnel. Featured in the display is progress in connecting aluminum, including a full-tension splice for ACSR and C-type connectors prefilled with joint compound.


16 ft., 255.5 ft. head butterfly valve which B-L-H has built for Puget Sound Power & Light Company's Lower Baker River Project.
Detail of valve seat

Adjustable seat designed by B-L-H for butterfly valve cuts leakage to minimum

Built for the Puget Sound Power & Light Company, this hydraulically operated B-L-H butterfly valve reduces leakage to a minimum by means of a specially designed valve seat that is simply and quickly adjusted. Since it is used to effect complete closure in emergencies caused by failure of the wicketgates to operate, as well as during scheduled shutdowns of the turbine, the need for a valve that will virtually eliminate leakage is vital.

Through its Eddystone and Pelton Divisions, B-L-H has built hundreds of butterfly valves of all sizes. In addition, B-L-H manufactures governors, pumps, surge suppressors, all four basic types of hydraulic turbines, and related equipment.

For illustrated bulletins, write to B-L-H Corporation, Philadelphia 42, Pa., or Pelton Division (B-L-H), 2929 Nineteenth Street, San Francisco 10, Calif.

BALDWIN · LIMA · HAMILTON

Eddystone Division

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Hydraulic turbines • Weldments • Dump cars • Nonferrous castings • Special machinery • Bending rolls • Machine tools

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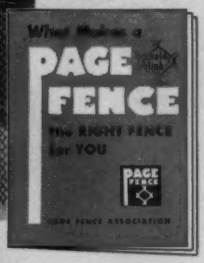


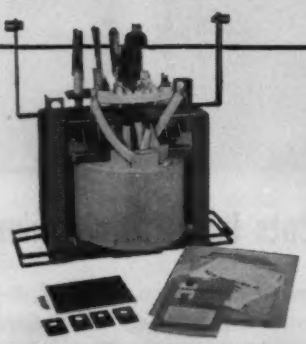
You are invited to write for a file-size folder packed full of information that's essential when making decisions leading to the fence that's BEST FOR YOU. Ask for Folder DH-26.

• When you need a fence it will be much to your advantage to have full knowledge of the many choices of component parts that PAGE provides. You can choose from 8 heights—4 fabric metals—2 types of metal posts—6 styles of gates. All these and other features are pictured and described in the folder offered above. It also supplies facts about the PAGE localized engineering and erecting service that assures highest grade workmanship and lasting satisfaction. Page Fence Association members, located in more than 100 cities, are listed in Folder DH-26. See that list for name of member nearest you.

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

ORIGINAL FACTORY QUALITY plus these Money-Saving Features



- ✓ **Compact Design** permits higher kva rated assemblies to be substituted in old tanks.
- ✓ **Light Weight** facilitates installation.
- ✓ **Adjustable Anchoring Arrangement** assures accurate fit in various size tanks.
- ✓ **Specially Designed,** oil-filled metal container protects unit against moisture and damage during transit. Assembly is thoroughly dried in controlled oven, factory tested and immersed oven-hot in container.
- ✓ **Provisions for Mounting** low voltage breaker and windings to operate signal light are standard.

ALLIS-CHALMERS Core and Coil Replacement Assemblies

Get All the Facts. See your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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A-5341

Two Cables To Connect S.F. and Hawaii Phones

Service over the 2,400-mile double submarine telephone cables between Point Arena (San Francisco) and Island of Oahu (Hawaii) is expected to begin by mid-autumn. This will be the first ocean cable for voice transmission to utilize operator dialing.

Its design is similar to that of the transatlantic cable pair of the repeatered type which began operation in September, 1956, between Newfoundland and Scotland. But here the deep sea portion has a higher tensile strength armor wire to meet the greater Pacific depths encountered.

The two cables are being laid about 25 miles apart and the overall project cost will total about $37 million. Cable laying has proceeded at about an average rate of 6 knots. Thirty-six simultaneous conversations by submarine cable can be handled.

Simplex Wire & Cable Co, Cambridge, Mass., is manufacturing about 60% of the cable and armoring all the repeaters used in the installation. This has been done at the company's Newington, N. H., plant. Other 40% of the cable was made by Submarine Cables Ltd of England.

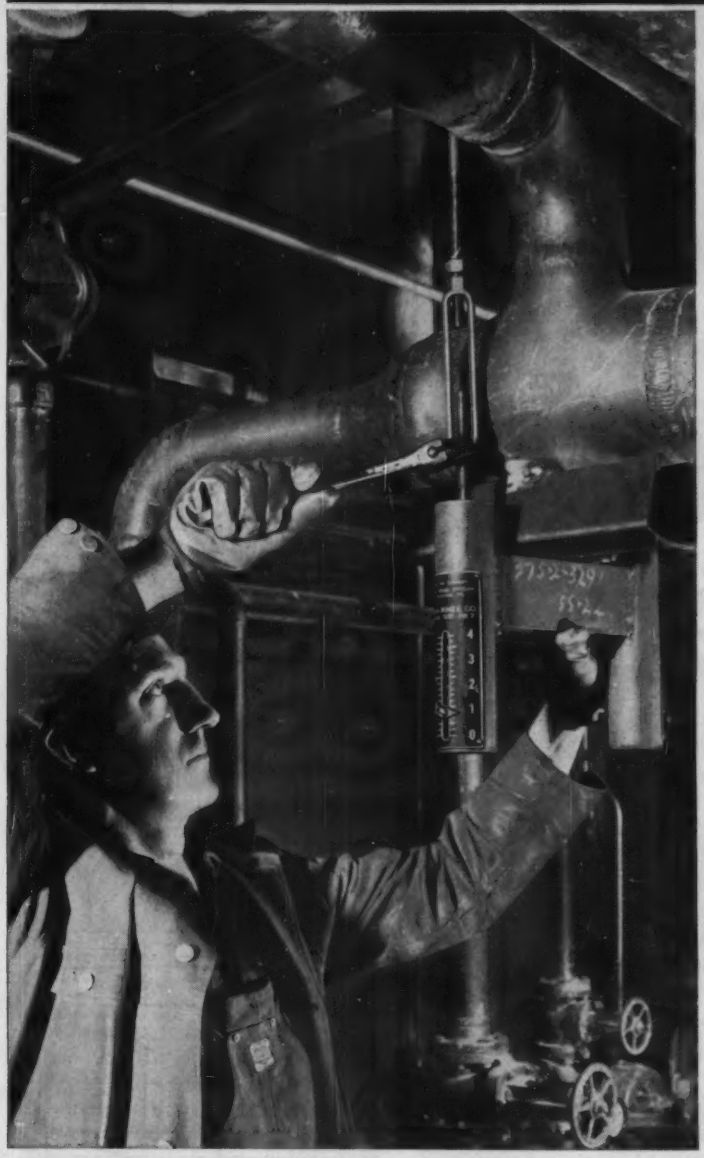
The American Telephone & Telegraph Company's Long Lines Department and the Hawaiian Telephone Co are joint owners of the ocean cable system.

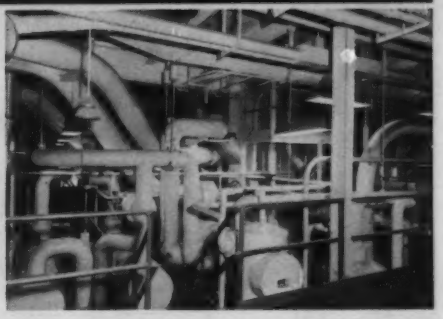
M & M BRIEFS

Fischer & Porter Co, Hatboro, Pa., has purchased an electronic differential analyzer. This analog computer will be used for studying dynamic control system performances for analysis of the operating characteristics of the company's industrial instruments and instrument components under development.

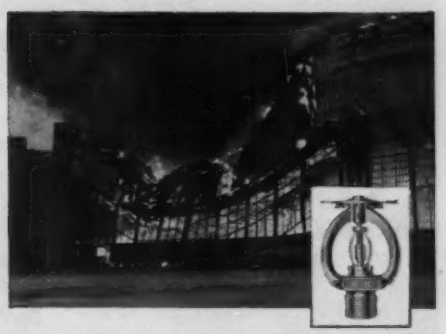
NEPCO—National Electric Products Corp, Gateway Center plant, Pittsburgh, has Integrated Data Processing. This system includes improved planning, more efficient production, stepped-up sales, faster deliveries, and prompt billing.

BLAW-KNOX has what it takes—to provide these products and services





Heater piping system in this modern generating station is typical of many high temperature, high pressure systems prefabricated and erected by Blaw-Knox. Experienced piping engineers, modern shop facilities and a new Blaw-Knox digital computer method for fast, accurate calculation of piping stresses are available to you. Let us know your requirements and we'll provide the service you need. For more information, write for Bulletin No. 2443—"Piping for Industry."



Out of every 100 firms who lose their records in a fire, 43 never reopen for business. Be safe. Let a Blaw-Knox fire-protection engineer study your needs—and explain how you can pay for the system on our lease or deferred payment plan. To get more information send for Bulletin No. 2426—"Fire Can Destroy Your Business."

Blaw-Knox trapeze functional spring hanger installed in first large atomic generating station. Vital power piping system for the atomic generating unit in the Duquesne Light Company's Shippingport Station is supported by Blaw-Knox custom-engineered hangers.

Blaw-Knox makes a complete line of standard and custom-engineered pipe hangers, supports, and vibration eliminators. Each is a complete packaged unit, designed for a specific purpose and constructed to comply with the "code for pressure piping." Available in types and sizes to meet varying conditions, ready to install.

Blaw-Knox engineers, who have solved many difficult hanger and piping vibration problems, are always available to both design and make recommendations for your hanger requirements. For further information, write for Catalog No. 54.

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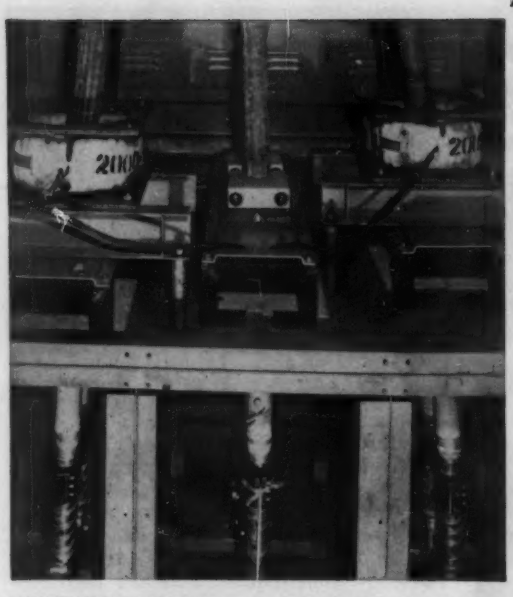
...complete line of automatic sprinkler systems for standard and special hazards



GENERATOR LEADS were one of the first applications considered in developing silicone-rubber cables. These G-E silicone-rubber generator leads are in use at the Washington Water Power Company's Cabinet Gorge generating plant.

Breaking the TEMPERATURE BOTTLENECK

The story of General Electric silicone-rubber cable

Several years ago, electrical engineers in generating stations and in industry were faced with what was virtually a bottleneck in the use of high-temperature equipment. They had already obtained greater equipment capacity and reliability through the development and rapid adoption of Class H insulation for generators, transformers, motors, and switchgear. (For example, windings on Class H insulated motors could withstand an operating temperature of 180 C. Switchgear was available for operation at 85 C to 100 C).

But, in many cases, this capacity could not be fully utilized, and the reliability was partially negated, by the cables then available. These cables, which had a maximum permissible copper temperature of 70 to 85 C, could neither carry the load nor withstand the temperatures of the equipment to which they were connected.

A number of electric utilities developed temporary solutions, such as locating copper connections on transformers and switchgear in remote spots away from the heat. On motors, cable connections were stripped of their regular insulation and rewound with hand-applied Class H insulation.

Developing new insulations

To find an answer to the problem of high temperatures G-E engineers continued their search for new insulations. Although asbestos and glass had excellent high-temperature qualities, their low dielectric strength was a drawback — especially in applications above 600 volts.

As part of their continuing search, General Electric engineers tested a form of silicone—silicone rubber. Investigation showed that silicone rubber glass tapes possessed excellent qualities. Furthermore, these tapes could be applied to cable by the same economical methods as conventional tapes of varnished cambric.

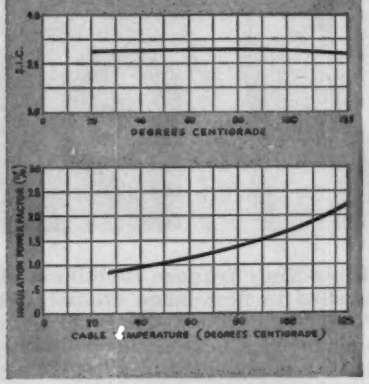
The result? A new cable insulated with silicone-rubber-coated glass cloth was developed. Because of its outstanding mechanical and dielectric advantages one of the first applications was its use as high-temperature generator leads. (See Fig. 1.)

New silicone-rubber cables with extruded insulation were also developed for other applications — for power and control circuits. These cables are rated at 125 C conductor temperature for service up to 15 kv for tape types and 5 kv for extruded types.

Thus, General Electric achieved another first with these cables that are proving especially valuable to plants where thermal bottlenecks prevent full use of equipment or where space is limited.

Fig. 1: DIELECTRIC PROPERTIES OF SILICONE-RUBBER GENERATOR CABLE

Typical test results obtained on a single-conductor, 2500 MCM, 15 kv cable, insulated with 0.25 inches of silicone-rubber-coated glass tapes.



IN 75 YEARS, power cable technology has progressed from the Edison Tube of 1881, shown being installed in New York City, to today's G-E silicone-rubber cables.

thermore, silicone-rubber cables increase the reliability of your entire electrical system because the weak link of low-temperature cables has been removed. The recurrent expense of replacing burned-out cable is minimized—an important factor where hot spots (around furnaces, steam pipes, and other sources of high ambients) are problems.

Free booklet offered

General Electric has prepared a new booklet containing complete information on the new silicone-rubber cables. You can obtain your copy by writing for *Silicone-rubber Wire and Cable* to Section W178-927, Wire and Cable Department, General Electric Company, Bridgeport 2, Connecticut.

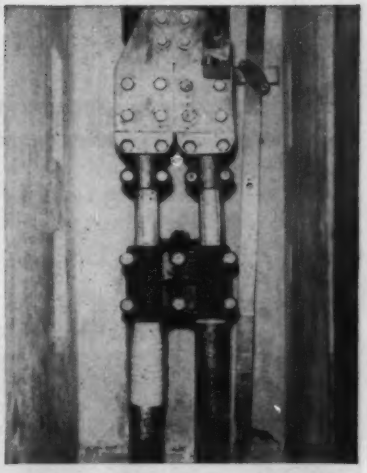


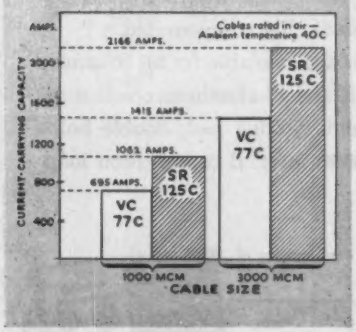
PHOTO SHOWS termination of 2500 MCM, 15 kv silicone-rubber-insulated cable in Con Edison's Hell Gate generating station. Stress cone is completed on cable at left —in process on cable at right.

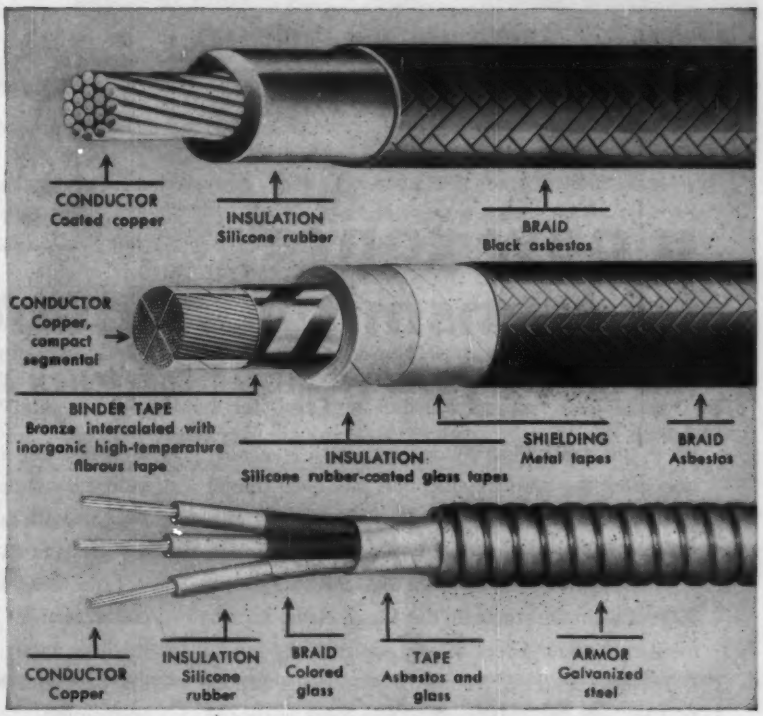
Economic considerations

Silicone-rubber cables offer many economic advantages due to their greater current-carrying capacity (see Fig. 2 below). First, they can be installed in existing ducts and conduits, thereby reducing first costs. Second, the high-current leads require less space on new jobs —and future expansion need not involve extensive renovation. Fur-

Fig. 2: COMPARISON OF CURRENT-CARRYING RATINGS

Varnished cambric vs silicone rubber cable. Based on 9 cables in duct bank, 100% load factor, 25 C earth, open-circuit sheath.

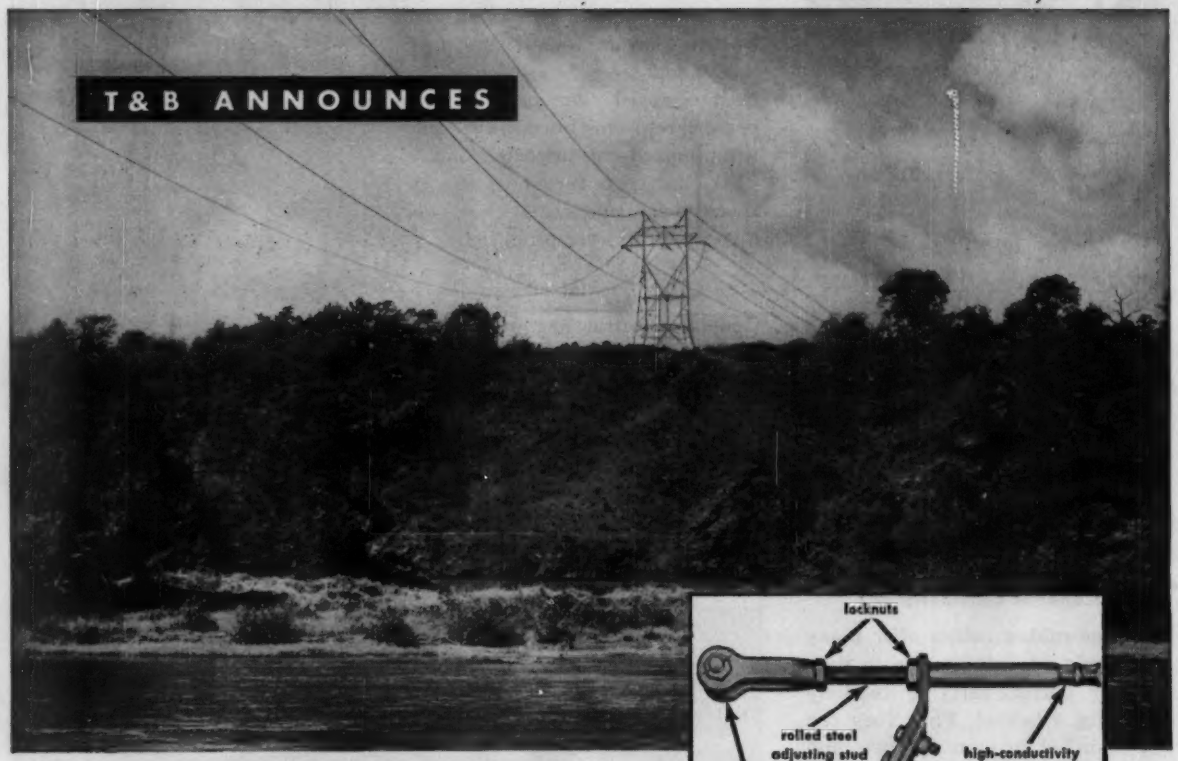




TYPICAL CONSTRUCTION OF SILICONE-RUBBER CABLES. (Top)—Power cable withstands high temperatures in wet and dry locations, exposed or in conduit. (Center)—Generator cable used for high-current generator leads. (Bottom)—Control cable, used for control or signal circuits in wet and dry locations, withstands flame and constant high temperatures.

Progress Is Our Most Important Product

GENERAL ELECTRIC



a new concept in transmission dead ending!

DEAD END CONNECTORS PERMIT SAG CORRECTION AFTER JOINT IS COMPLETED

Now you can adjust conductor sag to specification after the strain connection has been made! Four inches of clevis adjustment available provides great sag adjustment. For example: in a 700 foot span of 795,000 CM A.C.S.R. sagged at 50% of ultimate strength, the 4 inch clevis adjustment will allow 4 feet of sag adjustment.

The new dead end connector gives many important advantages: transmission line dead ending at river crossing and over rough terrain is simplified, more economical; "bundled" cables can be easily sagged with complete uniformity; line measurement errors can be readily compensated.

T&B Dead Ends are available for all commercial sizes of A.C.S.R. and all-aluminum conductors in three types: single bolting pad, double bolting pad, and with an integral compression loop connection.

For complete specifications on the new dead ends, as well as the complete new catalog of T&B Method transmission line connectors, tools and accessories, send the coupon below.

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ELECTRICAL BUSINESS OUTLOOK

Electrical World
AUGUST 19, 1957

'Though pretty much expected, the hike in money rates came with a bang last week. Bankers point out that the increase in the discount rate was basically an adjustment to short-term market rates which had spurted earlier in the week. But the Fed's move meant more than that—they're still worried about another round of inflation.

Tight money has already had a dampening effect on business borrowing this year. So far, loans to business have been running not much more than $500 million over last year. That compares with a $2 billion jump over the same period in '56. Actually utilities and sales finance companies are the only two groups borrowing more than they did last year.

The restrictions on credit also tie into the cautious inventory policy of the last few months. Many purchasing agents have cut their stocks down to a 30-day supply. With no shortages and sluggish sales, it just doesn't make much sense to tie up expensive funds by carrying inventories.

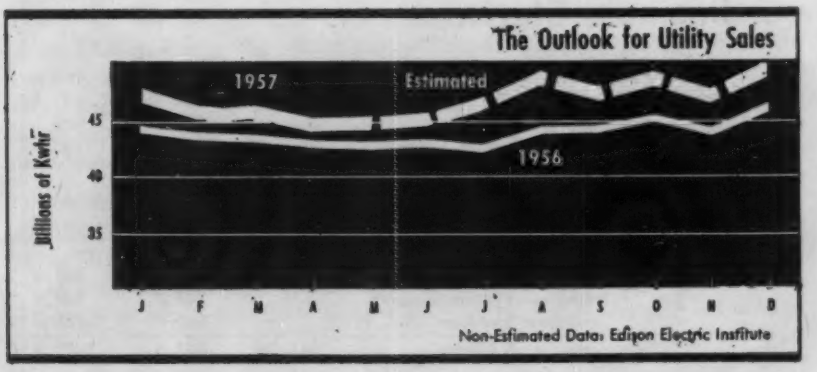
The big question now is what impact the higher interest rates will have on capital investment. While many corporations have switched to the security markets for needed funds, interest rates are still a potent factor. With excess capacity building up, some expansion plans may take a breather in '58.

Credit buying has been decelerating. Savings jumped from 6% to 7.3% of disposable income in the second quarter. An indirect effect of the tight money policy seems to be a hesitancy among consumers to extend themselves any farther than they have already. They expect the government's measures against inflation to work, and they are getting a bit more cautious.

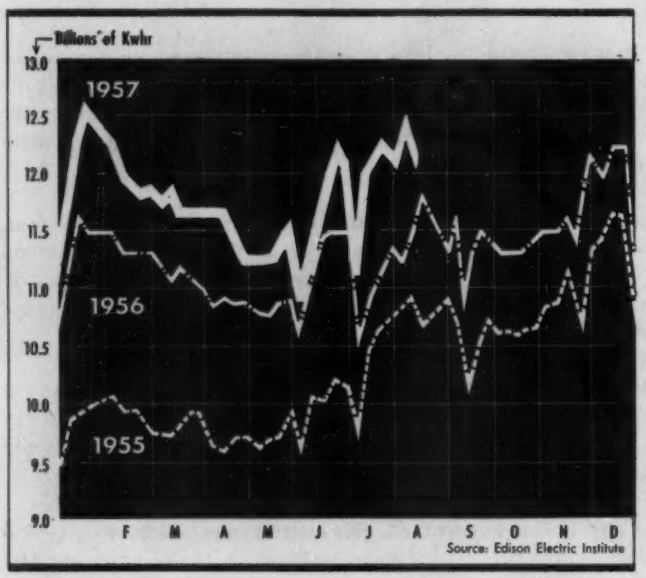
This caution is helping keep appliance sales low.

But appliances sales may not be as bad as statistics indicate. The statistics are built up around manufacturers' shipments, which are down 18%. Over the counter sales are so hard to tabulate that statisticians don't try. Since tight money, merchants have been reducing inventory, which naturally cuts manufacturers' shipments but does not necessarily mean that the market is drying up.

And a spokeman for General Electric Co's appliance division said: "We expect the industry to wind up the year about 5% below 1956, which was, after all, a record-breaker."



STATISTICS



OUTPUT

Week ended August 10, 12,070,000,000 Kwhr Up 4.7%

Per Cent Change From Previous Year

	July 27	Aug. 3	Aug. 10
Total U. S.	+ 8.4	+11.5	+ 4.7
New Eng.	+ 5.5	+ 9.0	+ 4.2
Mid. Atlan.	+ 8.1	+11.3	+ 3.0
Cent. Ind.	+10.3	+13.7	+ 3.2
West Cent.	+15.1	+19.0	+ 5.0
Southeast	+ 4.5	+ 6.7	+ 3.9
South Cent.	+13.0	+16.6	+ 5.6
Rocky Mount.	+ 4.7	+ 8.1	+ 8.0
Pacific			
NW	+ 8.0	+ 6.5	+10.5
SW	+ 6.9	+12.6	+ 7.3

Seasonally Adjusted Index 225.9
Week Ago 234.8
Year Ago 217.7

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 5.9%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	May	122.79	122.27	117.43	4.6
Peak—Class 1 Systems. million kw	May	97.8	97.7	92.8	5.4
Estimated Dec. '57 Peak	May	113.6	113.8	114.3	−0.6
Production—billion kwhr	May	51.70	50.67	49.09	5.3
Hydro		11.80	12.05	11.71	0.8
Fuel		39.90	38.62	37.38	6.7
Sales—billion kwhr	May	46.60	47.15	44.18	5.5
Residential		11.86	12.72	11.07	7.1
Commercial		7.38	7.25	6.75	9.3
Industrial		24.89	24.66	24.03	3.6
Other		2.48	2.52	2.33	6.4
Fuel Consumption	May				
Coal—million tons		12.60	12.50	12.05	4.6
Oil—million barrels		6.31	6.47	4.47	41.2
Gas—billion cu ft		108.66	98.80	110.51	−1.7
Net Income Class A & B Co's—$ million	May	101.75	115.93	102.50	−0.7
Residential Customers—millions	12 mos.	46.06	45.99	44.76	2.9
Revenue per kwhr	ended	2.58¢	2.59¢	2.62¢	−1.5
Avg kwhr per customer	April 30	3,034	3,021	2,838	6.9
Avg annual bill		$78.28	$78.24	$74.36	5.3

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	June	143	143	141	1.4
ENR Construction Cost	Aug.	154.8	151.8	146.0	6.0
BLS Cost-of-living	June	120.2	119.6	116.2	3.4
New Orders for Machinery (1950 = 100)	June	155	149	154	0.6
NEMA Sales					
Insulation materials	May	148	145	158	−6.3
Electric appliances		88	83	103	−14.6
Wholesale prices	May				
Motors and generators		141.3	141.4	132.1	7.0
Transformers and regulators		147.7	147.4	137.5	7.4
Switchgear and fuses		165.9	164.4	151.2	9.7
GNP—annual rate—$ billion	2nd Qtr.	433.5	429.1	410.8	5.5

MANAGEMENT BULLETIN

FINANCE

Money is becoming tighter. This is the feeling in banking circles as the prime interest rate jumped to 4½%, the highest rate in 26 years. It was just about a year ago that the rate went to 4% from 3¾%. Other commercial paper rates shot upward after the announcement. The Federal Reserve Board in several cities increased the rediscount rate from 3 to 3½%, highest since 1934. This move by the Fed could mean that it expects business to continue good for the balance of the year.

However, interest rates will ease in a year or so, thinks Under Secretary of the Treasury W. Randolph Burgess. He feels that "When everything is pointing one way that's the time to start looking for developments in the other direction."

In this tight money market, suggests Michael J. Kraemer, senior consultant, Commonwealth Services, Inc, in the monthly "Public Utilities—Perspective" issued recently, you may want to consider convertible securities. He says that with a high level of business capital spending and a continuation of Federal Reserve Board policy to hold the line against inflation "could add up to continued tight money."

In such a market and with common stock prices generally at good levels many utility companies are in position to consider the sale of securities convertible into their common stocks. A conversion feature, he points out, could be far less onerous than a five or ten-year "no refund" provision or a very high coupon rate or debt securities marketed at this time.

Many investors, he says, view convertible securities with favor because:

- Common stocks are some hedge against inflation and the purchaser of a convertible security generally has a long-time call on a common stock at a fixed price or prices.
- Prior to conversion the investor is either a creditor or a preferred stockholder senior in rank to the common equity.
- The conversion feature is a hedge against rising money rates (declining bond and preferred stock prices).

Investment bankers, because of the foregoing features, he says, can generally "locate a relatively larger number of investors willing to purchase a convertible debenture or convertible preferred stock."

Theory that the drastic increase in interest rates on new funded debt securities might seriously affect utility equity earnings needs examination.

It's a good bet though that these higher rates will have no significant effect on annual earnings of even rapidly expanding utilities. Where expansion is at a lesser rate, the impact would be even smaller.

Let's take a case. Assuming a utility with $200 million assets and spending $20 million a year for expansion has a capitalization of 37% common equity (about the industry average) with earnings on this book value of 12%, or about $8.8 million a year. Next assume that 75% or $15 million of the expansion must be financed from capital funds. Now assume the proportion of new bonds to this new capitalization is about 55% and that interest on these bonds has increased 1% per annum, or $82,000 per annum over the life of the bonds.

Divide this $82,000 in half to reflect the income tax deduction, which leaves about $41,000 a year of increased net interest charges. Now apply this back to the $8.8 million of common stock earnings. You find it amounts to less than ½ of 1%. Such a minor decline in earnings could not affect dividends. And dividends remain the primary factor on which market values of most utilities are based.

However, consideration must be given to adequacy of additional earnings to provide a reasonable return on the added plant.

RATES

Utility rate increases are imperative, says Trus Hyde, Jr, utility security analyst and partner, Josephthal & Co, in his latest "Research Bulletin." Earnings of most utilities in the first half of 1957 have been "exceedingly poor." What is even more alarming, he points out, is that they were "poorer" in the second quarter than in the first indicating that the unfavorable trend is accelerating.

A comparison of 56 utilities currently available, he says, shows operating earnings (before income taxes) increased 3.7% in first quarter of 1957 and only 1.6% in the second quarter. For the six months they were up 2.7%. This is inadequate, warns Hyde, "to provide the necessary return on the additional capital which is required to finance the utility net expansion program of 8% to 10% a year." . . . Many utilities, therefore, are approaching the time when rate increases cannot be deferred much longer." If you would like a copy of this study, write Trus Hyde, Josephthal & Co, 120 Broadway, New York 5.

EMPLOYEE RELATIONS

Journey lineman pay in the Pacific Northwest has reached $2.97 an hour, says the 11th annual wage survey of the Northwest Public Power Association. This compares with $2.85 an hour in 1956 and $2.70 in 1955. The latest 12¢ boost is about 4.2%, or about 40% more than the 3% rise in the cost of living.

Fringes are also up. On top of the $2.97, fringes totaled 75¢ an hour which gives a lineman $3.72. As against the 1947-49 base period, NPPA says, nominal wages have increased 97¢, or 48½% and fringes 45¢, or 150% for a total added labor cost of $1.42, or 61.17%. More rapid rise in fringes is reflected in the fact that where formerly they amounted to 15% above the base or nominal pay rate, now they are 25¼% on top of the new base which itself is 48½% higher.

Annual improvement factor. Data is consistent, NPPA points out, with the conclusion of the 1956 survey which indicated that on a cumulative basis the total labor cost has risen three times as fast as the cost of living.

Here's the way it can be checked, NPPA says: "Allowing only for 20% rise in living cost would increase the base period pay level from $2.00 to $2.40, the fringe from 30¢ to 36¢, and the total labor cost from $2.30 to $2.76. The actual rise to $3.72 is $1.42, or three times the 46¢. "Copies of the survey are available from Gus Norwood, executive secretary, NPPA, 1311 Columbia, Vancouver, Wash.

What starting salary is the engineering graduate getting today? Illinois Institute of Technology reports that January and June graduates of the school got jobs averaging $473 a month. This is $82 more per month that the 1956 average for engineering graduates, says Earl C. Kubicek, director of alumni relations.

Union employees at Wheeling Electric Co get wage boost. UWUA and the WECO Employees' Association are receiving a 5% wage increase which went into effect on August 1.

PUBLIC RELATIONS

Color filmstrip on the electric utility industry is now available from the Edison Electric Institute. Presentation takes 30 to 40 minutes' time. It covers: Growth of the power industry, free enterprise and American productivity, free market financing, industrial productivity through electrification, efficiency improvements, the "monopoly" question, government encroachment, some facts about TVA, the conflict of ideologies, nuclear energy, and the future. If interested, write EEI, 420 Lexington Ave, New York 17.

Give the GUY a CHANCE..

8 WAY EXPANDING ANCHORS

FOR "ALL 'ROUND" HOLDING POWER

It's not surprising that in every field test the Chance 8-Way Expanding Anchor holds more than its rated load because its design just makes common sense. Eight blades expand to form a pyramid shaped square—there is no wasted space between blades. The load is distributed evenly—all around the hole. It seems logical that it should hold more, and it does. That's why it's on so many company standards.

The 8-Way is usually installed in clay or loam. Available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying.

FIELD ASSISTANCE

Chance Regional Guying Specialists have the practical experience and technical know-how to demonstrate proper anchoring to your field personnel and make field tests to aid in anchor selection.

JACK CURTRIGHT*, "the Chance Anchor Man," stakes his reputation on . . .

the A B C's of Anchoring

Good anchoring is low cost insurance against line sag, leaning poles, storm damage, and other line construction failures.

The formula for good anchoring is as simple as A-B-C and just as basic . . . Check the guy load, determine the type of soil and what it will hold, select the *right* anchor for the soil and guying condition, and install it properly. Chance engineers have made this an easy formula to follow by designing an anchor for every guying condition.

In tests by anchor users, Chance Anchors almost always take top position for holding power and for ease of installation in their specific applications.

A lways B e C onfident

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*Chance Anchor Sales Manager

Serving the Utility Industries since 1907

50TH ANNIVERSARY

H. B. CHANCE COMPANY

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8 WAY EXPANDING ANCHORS

FOR "ALL 'ROUND" HOLDING POWER

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FIELD ASSISTANCE

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NEVER-CREEP

Reinforced structural steel. Pulls entir solid, undisturbed earth. For extra h in clay or loam.

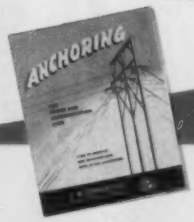
CROSS-PLATE

For heavy-duty anchoring in machine-bored holes. Holds better than logs or slugs. Saves time and money.

EXPANDING ROCK

No grouting necessary. The greater the pull, the tighter it wedges against solid rock. Set in 2" drilled hole.

Your Chance A



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MIKE THE MOLE says:

Here is the most complete guide to better anchoring ever developed. It's chock full of how-to-do-it material to help you select the right anchor for every guying job—and install it properly. It's FREE!

ANCE ANCHOR for every guying need

s entirely against
xtra heavy loads

NO-WRENCH SCREW

For hand or machine installation. Pitch-controlled blade goes down faster and adds to holding power in sandy soil, soft clay or loam.

SWAMP SCREW

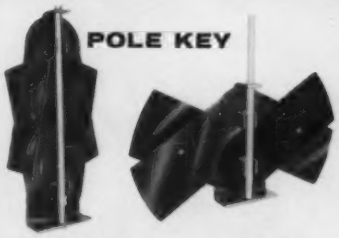
For swamps, marshes, quicksand, river crossings or seasonally flooded areas. Screws down deeply by adding sections of pipe.

8-WAY CONE

Acts as inverted wedge. Flaring base and flat faces increase wedging action. Used in rocky areas with rock wedging.

WRENCH TYPE SCREW

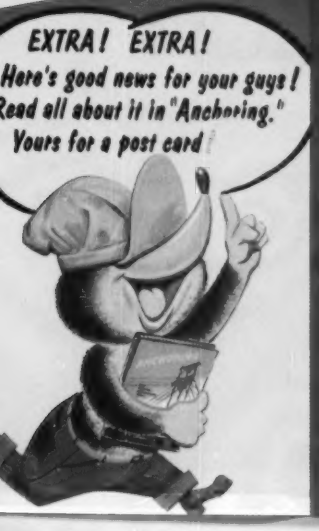
All steel—double arc welded. Anchor hub absorbs installation strain. For light loads in sandy soil, soft clay or loam.



POLE KEY

Keys poles at the butt to reinforce them against unbalanced loads in soft soil. Ideal for congested urban areas.

ce Anchor Distributor can supply you from stock. Specify Chance for Service!



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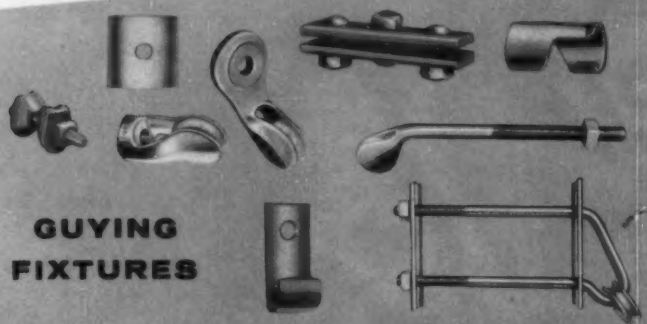
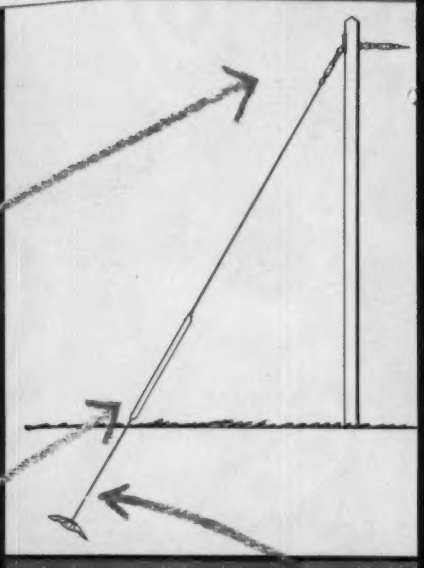


GUYING FIXTURES

For neatness, efficiency and economy nothing equals Chance Guy Fixtures on the pole. They save the wrap-around strand, and the full-rounded Thimbleye gives complete strand protection during slack pulling operations and when in use. Chance fixtures are drop forged from high grade steel—heavily galvanized. The line includes everything for the guy.



CHANCE GUY GUARDS

EASY INSTALLATION

HIGH VISIBILITY

LONG LIFE

MONO-BOLT GUY GUARD

TAPERED GUY GUARD

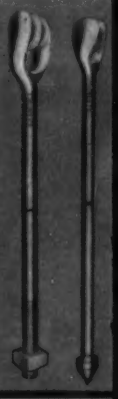
Chance Mono-bolt Guy Guards are easy to install. No stretching for high bolts—the single, easily accessible bolt is at the bottom of the guard. Mono-bolt Guards come in half or full round construction, in 7 or 8 foot lengths.

Chance Tapered Guy Guards fit over all kinds of guy clamps—even large U-bolt types. Full round construction, 8 foot lengths.

These guards fit any size rod from ½" to 1¼" and are made of hot galvanized steel for long life and high visibility.

GUY RODS

There is a difference in anchor rods—in the shape of the eye and in the galvanized protection. The full rounded Thimbleye design, an A. B. Chance Company development, protects the cable from strain at any angle of pull, prevents binding and aids slack pulling. You get the same protective contour in Thimbleye, Twineye, or Tripleye Chance rods, Threaded or Never-Creep types.



CHANCE TOOLS *for faster installation*

Chance Expanding and Tamping Bar speeds installation—assures proper expansion of anchors.

Chance Telescoping Trip Auger—a new fast cutting auger for digging anchor holes.

Chance Never-Creep Installing Bar simplifies hanging of plate anchors on rod.

Chance Rod Trenching Tool cuts channel quickly for cross plate anchor rod.

A·B·CHANCE CO·

MEETINGS CALENDAR

AUGUST

Western Electronic Show and Convention—Annual Meeting, Cow Palace, San Francisco, Calif., August 20-23.

Electric Companies Advertising Program—Copy Group Meeting, Seaview Country Club, Absecon, N. J., Aug. 22.

American Institute of Electrical Engineers—Pacific General Meeting, Pasco, Washington, Aug. 28-30.

SEPTEMBER

American Institute of Electrical Engineers—2nd Special Technical Conference and Exhibit on Magnetic Amplifiers, Hotel Penn Sheraton, Pittsburgh, Pa., September 4-6; Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Sept. 24-25.

Instrument Society of America—12th Annual Instrument Automation Conference and Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 9-13.

Illuminating Engineering Society—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

Electric Companies Public Information Program—Steering Committee, New York City, Sept. 11; Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

Edison Electric Institute—Industrial Power & Heating Group, Van Curler Hotel, Schenectady, N. Y., Sept. 11-13; Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25; Meter & Service Committee, Hotel Nicolet, Minneapolis, Sept. 23-25; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

Maryland Utilities Association—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

Southeastern Electric Exchange—Engineering & Operation Section, Biltmore Hotel, Atlanta, Ga., Sept. 19-20.

Public Utilities Association of the Virginias—39th Annual Meeting, White Sulphur Springs, West Virginia, Sept. 19-21.

Missouri Valley Electric Association—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 23-24.

American Society of Mechanical Engineers—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

Electric Companies Advertising Program—Copy Group Meeting, Detroit, Mich., Sept. 25.

OCTOBER

Pennsylvania Electric Association—50th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 2-3.

Indiana Electric Association — French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

Missouri Valley Electric Association—Sales & Rural Conference, (and Home Service Workshop), Lassen Hotel, Wichita, Kansas, Oct 2-4.

International Association of Electrical Leagues—Annual Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

National Industrial Conference Board—Atomic Energy Course for Management, Hotel Moraine on the Lake, Highland Park, Ill., Oct. 6-12.

Iowa Utilities Association — Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 7-8.

Iowa Electric Institute—Prime Movers Committee, Hotel New Yorker, New York City, Oct. 7-9; Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 9-11; Transmission & Distribution Committee, Statler Hotel; Boston, Massachusetts, October 17-18; Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Virginia, Oct. 23-25.

American Society of Mechanical Engineers—Lubrication Conference, sponsored jointly with American Society of Lubrication Engineers, Royal York Hotel, Toronto, Canada, Oct. 7-9; Power Conference, American Hotel, Allentown, Pennsylvania, Oct. 21-23.

National Electronics Conference, Inc—13th Annual Meeting, Hotel Sherman, Chicago, Ill., Oct. 7-9.

American Institute of Electrical Engineers—Fall General Meeting, Morrison Hotel, Chicago, Ill., October 7-11; Computers in Control Symposium, Hotel Claridge, Atlantic City, N. Y., Oct. 16-18.

Southeastern Electric Exchange — Accounting Section, Fort Sumter Hotel, Charleston, S. C., Oct. 10-11; Sales Section, Tutwiler Hotel, Birmingham, Ala., Oct. 16-18.

Rocky Mountain Electric League—54th Annual Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 13-17.

Interstate Power Club—Hotel Martinique, New York City, N. Y. Oct. 14.

Oklahoma Utilities Association — Electric Light and Power Division, Woodward, Okla., Oct. 25; Eastern District, Bartlesville, Okla., Oct. 25.

Atomic Industrial Forum—Annual Conference, New York City, Oct. 28-30.

American Nuclear Society—Winter Meeting, New York City, Oct. 28-30.

National Association of Railroad Utilities Commissioners—Annual Conference, Peabody Hotel, Memphis, Tennessee, October 28-31.

Industrial Management Society—21st Anniversary Industrial and Management Clinic, Hotel Sherman, Chicago, Ill., Oct. 30-Nov. 1.

Institute of Radio Engineers—3rd Annual Technical Conference of the Professional Group on Electron Devices, Shoreham Hotel, Washington, D. C., Oct. 31-Nov. 1.

NOVEMBER

Edison Electric Institute — Accident Prevention Committee, Penn-Sheraton Hotel, Pittsburgh, Pa., Nov. 6-8.

Pacific Coast Electrical Association — Hawaiian Conference, Reef Hotel, Honolulu, Hawaii, Nov. 7-8.

Institute of Radio Engineers—Third Annual Instrumentation Conference, Atlanta Biltmore Hotel, Atlanta, Georgia, Nov. 11-13.

National Electrical Manufacturers Association—Traymore Hotel, Atlantic City, N. Y., Nov. 11-15.

Electric Companies Public Information Program—Inter-Regional Committee, Mayflower Hotel, Washington, D. C., Nov. 19.

Atlantic City Electric Ups Two Executives

CARL O. CARLSON

The new position of senior vice president of Atlantic City Electric Co has been assumed by Carl O. Carlson. James P. Hayward was named to succeed him as vice president in charge of electric operations.

Carlson will now coordinate the activities of the engineering, production, commercial, transmission, and distribution departments. A 31-year veteran with the utility, Carlson previously served in various capacities, including distribution engineer and superintendent of distribution. He is a 1920 graduate of Yale University.

Hayward began his career with Atlantic City Electric in 1925 as a survey assistant. He most recently served as manager of electric operations, a post to which he was named in 1953.

JAMES P. HAYWARD

Pennington Gets New VP Post

Georgia Power Co has announced the promotion of John F. Pennington from vice president in charge of operations to the post of vice president in charge of engineering and operations.

In his new capacity he will also supervise the company's land, purchases and stores, fuel supply, and claim departments. The addition of his new responsibilities resulted from the July 31 retirement of Ray N. Benjamin, former vice president and chief engineer.

Pennington, operations vice president since 1953, previously served as operating manager, chief engineer, and mechanical engineer. He joined the utility 39 years ago as a construction helper.

JOHN F. PENNINGTON

Southern Co Advances McGuire, Jaeger

JAMES H. McGUIRE

James H. McGuire has been elected vice president of the Southern Co and L. H. Jaeger is new vice president and treasurer.

McGuire joined Georgia Power, a subsidiary, in 1935. After service in the Atlanta sales department he was assigned to sales engineering posts and became assistant to the president in 1954. He was named assistant to the president of the parent firm this past January.

Jaeger, secretary and treasurer since 1955, joined Southeastern Power & Light Co, a predecessor, in 1924. He later was assistant comptroller, Commonwealth & Southern Corp.

In addition, D. B. Peck is new secretary and G. B. Campbell and R. F. Boudet were named assistant secretary-assistant treasurer.

L. H. JAEGER

ALL HE'S CHECKING IS WHAT'S ON THE REELS —NOT THE REELS THEMSELVES. These convenient one-way reels are now available with Rome's building wire, Triplex SD, and line wire.

There's no need to keep track of these one-way reels . . . they're non-returnable

Now available in all bldg. wire through 500 MCM, Triplex SD, and line wire

The non-returnable reel—first adopted as a standard by Rome Cable—gets rid of many of your recording, reshipping, and inventory headaches. Here are some of the ways it benefits you:

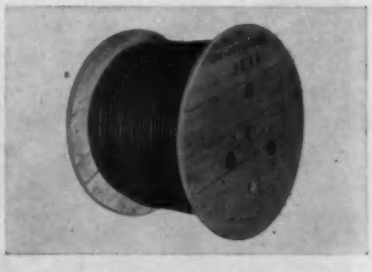
Eliminates bookkeeping costs. You avoid the extra paper work brought on by billing, crediting, and storing of returnable reels.

Saves storage space. When the wire or cable is used up, you simply destroy the reel or throw it away.

Handles easier. Rome's non-returnable reel is lighter to handle than an ordinary reel—yet sturdy and quite adequate for normal service.

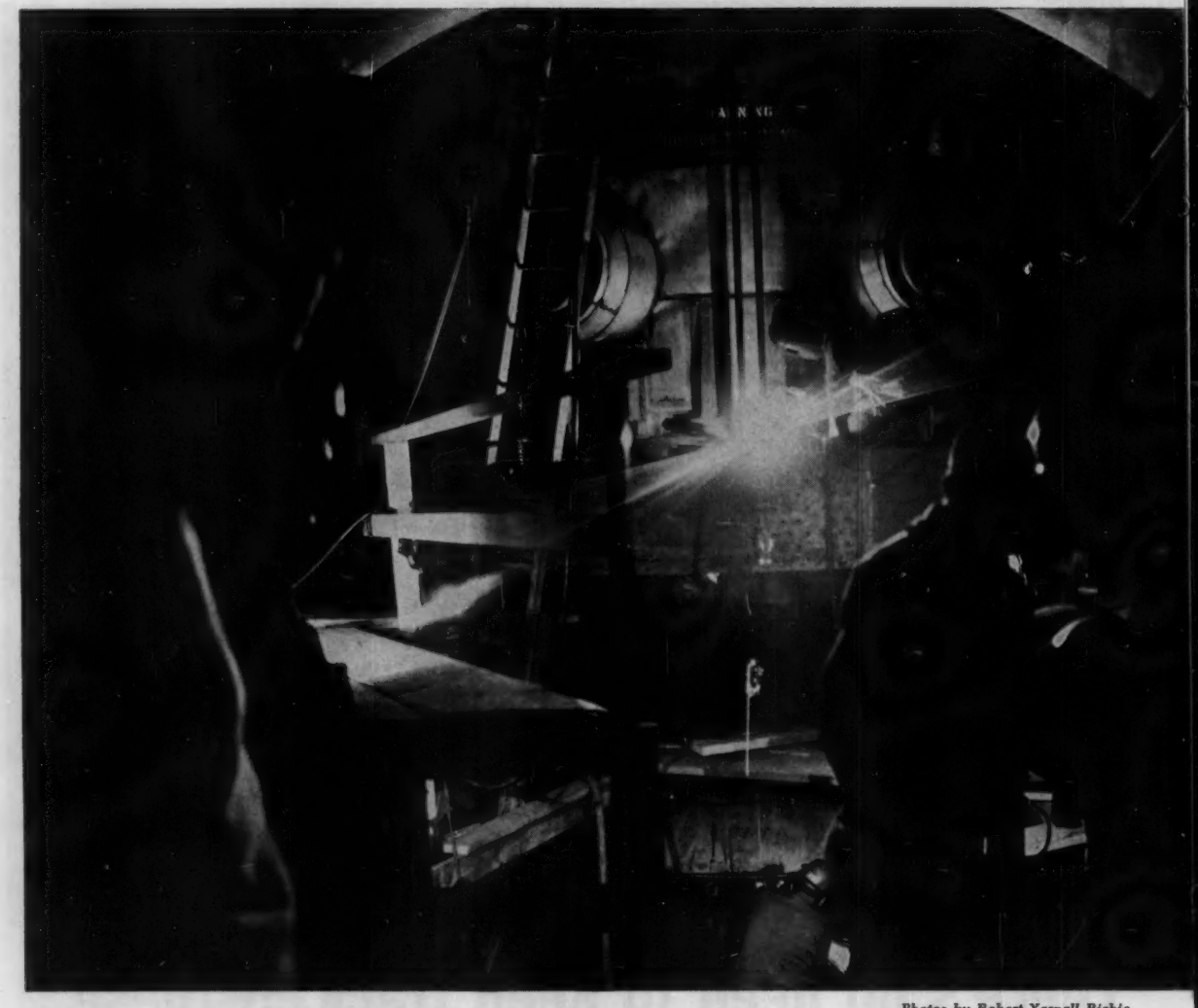
All these benefits are now available to you with all Rome's building wire through 500MCM, Triplex service drop cable, and line wire.

Be sure to consider the advantages of Rome's standard non-returnable reel package when you place your next wire or cable order. Contact your nearest Rome Cable representative for more information—or write to Dept. 139, Rome Cable Corporation, Rome, N. Y.



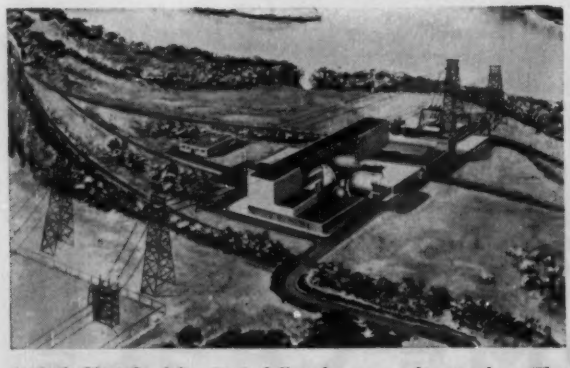
ROME CABLE

CORPORATION



Photos by Robert Yarnall Richie

Rome's station control cable installed



Artist's Sketch of first U. S. full-scale atomic-electric plant. This revolutionary power plant—under the operation of Duquesne Light Company of Pittsburgh—will be delivering electricity to home and industry in the Pittsburgh area late this year or early next.

Atomic-Electric Power will be controlled from this large cabinet installation at the Shippingport atomic power station. Nearly ten miles of Rome's highest quality station control cable were used in this vital system.

Partner to the Atom. Rome's control cable is here being installed in the nation's first major atomic power plant at Shippingport, Pennsylvania. Rome Cable furnished over 50,000 feet of station control cable for this important installation.

in Shippingport atomic power station

This country's first full-scale atomic power plant for the generation of electricity will contain almost ten miles of Rome's highest quality station control cable.

The selection of Rome's Rozone-Roprene cable—with a special over-all asbestos outer braid—for this epoch-making installation was no accident, for individual Rozone insulated-Roprene jacketed conductors represent the ultimate in control cable design and performance.

Advantages of Rozone insulation. Rozone—a high-quality oil-base compound—is an excellent insulation. Long and widespread experience has proved that its high-dielectric and impulse strength, combined with its resistance to corona and ozone cutting, makes it an ideal insulation for control and high-voltage power cables. Its electrical properties are practically unaffected by long-time immersion in water or burial in the ground.

Advantages of Roprene jacket. Roprene—a neoprene synthetic rubber compound developed by Rome Cable—provides an extremely durable and permanent mechanical protective covering for the individually Rozone-insulated conductors. It assures terminations that are resistant to abrasion, weather, and attack by chemicals and oils. And it is exceptionally resistant to fire.

Additional fire protection for this particular cable included a special over-all asbestos outer braid.

Specify premium-quality Rozone-Roprene control cable for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 802, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

W. R. HOUGH | W. H. HABER | H. D. LUKE | R. A. GEUDER

Reliance Elects Four Vice Presidents

Reliance Electric & Engineering Co has elected William R. Hough, Walter H. Haber, and Hugh D. Luke as vice presidents-operations groups, and Richard A. Geuder as vice president-marketing.

Hough will continue as vice president-engineer, a position he has held since 1948. A 28-year Reliance employee, Hough is also a member of the board of directors. He formerly was chief engineer of the firm.

Haber most recently served as manager of the Ashtabula Division and has been with Reliance since 1930.

Luke, who joined the company's manufacturing organization in 1953, comes to his new post from that of manager of the Ivanhoe Division.

Geuder has served in the capacity of general manager in charge of marketing since last May. He began his career with Reliance in 1929.

PERSONAL BRIEFS

Recently appointed district managers of Ohio Power Co were **John D. Hawkins,** at Canton; **O. R. Frese,** Cambridge; **L. A. Wright,** Bellaire; **Fred M. Zimmer,** New Philadelphia; and **William A. Black, Jr,** Waynesburg.

Howard O. Craghead is new company secretary at San Diego Gas & Electric Co. He replaces **Ray C. Cavell,** who retired after 47 years' service. **Jack A. Graham** was made assistant secretary and **Charles Davies,** assistant treasurer.

Brooke R. Hartman replaces retiring **John E. Ludeman** as manager of Pennsylvania Power & Light Co's rates and contracts department.

W. F. Bergan was recently named assistant secretary of Philadelphia Electric Co . . . Illinois Power Co has appointed **Ralph Rutherford, Jr,** manager at Carlinvale.

Virginia Electric & Power Co's new district superintendent at Fredericksburg is **Wadsworth Bugg, Jr.** He succeeds **Raymond C. Hodge,** now planning engineer, Richmond district distribution department.

Senior Vice President **Earl L. Griffith** of Consolidated Edison Co has been elected board chairman of Consolidated Telegraph & Electrical Subway Co, construction subsidiary.

City Light of Seattle, Wash., has named **Robert K. Walker** as distribution engineer in charge of overhead construction. His former post of supervising senior engineer has been assumed by **Glenn Ward-Davis.**

Retirement of **Malcolm Morrison** as vice president of municipal relations has been announced by Oklahoma Gas & Electric Co . . . **M. F. Clement** will retire Sept. 1 from his post as assistant vice president of Rockland Light & Power Co.

Newly named director of safety and training for Carolina Power & Light Co is **T. A. Albright** . . . Southwestern Public Service Co has named **Mrs Jimmie Louise Brown** as home service director.

Westinghouse Electric Corp's meter division has named **William K. Sonnemann** consulting engineer, relay department; **William E. Glassburn,** relay engineering manager; and **William E. Rich** section manager on induction, differential, and auxiliary relays . . . Named to fill the new post of assistant director of labor relations and group consultant, were **Kenneth H. Smith** for the General Products group; **George M. Nicholson,** Consumer Products; **G. E. Closson,** Defense and Atomic Power groups; and **W. W. Heimbach,** Apparatus Products .

Allis-Chalmers Manufacturing Co has appointed **H. G. Zambell** engineer-in-charge of test and development, Terre Haute Works; **W. C. Farneth** engineer-in-charge of development, Pittsburgh Works, **H. A. Wright** manager of product sales, control department; and **H. F. Banzhaf** assistant to the general manager, General Products Div.

At General Electric Co, **George D. Klump** was made manager-manufacturing engineering, small steam turbine debt; **Jerome T. Coe** manager of marketing, silicone products department; and **T. C. Chart** general manager, insulating materials section.

New ladder mount positions easily even on high-crowned or inclined roads

At last the horizontal positioning of ladder mounts on high-crowned or inclined roads can be done easily. Now one man can spot the new Keystone HDG ladder mount with virtually no effort. No lugging . . . no tugging—even against the heaviest gravity loads resulting from tilted parking.

WHAT'S THE SECRET? The new Keystone HDG ladder mount is driven by a specially-designed two-speed self-locking gear assembly. It provides low speed with high torque or high speed with low torque. To spot the ladder precisely or return it to the ladder rest is an effortless job.

RUGGED, FLEXIBLE, COMPACT. The new Keystone HDG ladder mount is ruggedly constructed to prevent deflection, side sway, and twisting. Assures longer life with minimum maintenance. Can be rotated horizontally through 360 degrees and locks automatically in position at any point. Requires only 42″ diameter for mounting in a truck.

Specify Keystone HDG ladder mounts by name on your next truck order. For further information write Electric Service Works, Delta-Star Electric Division, H. K. Porter Company, Inc., 17th and Cambria Sts., Philadelphia 32, Pa.

The speed-selector gear box that enables one man alone to "spot" the new Keystone HDG ladder mount on high-crowned, inclined, or level road.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

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READERS FORUM

Defends AIEE Policy

To the Editor:

As a long-time subscriber to Electrical World, a member of the AIEE since 1938, and a member of the National Society of Professional Engineers since 1950, and writing strictly as an individual expressing my own personal views, I find that I must take exception to a statement in your editorial on AIEE Board Policy published in the July 15 issue.

Quoting from the editorial, Paragraph 5, Line 3,—"With only a small representation from most professional societies, the responsibility far outweighs their ability to perform." I seriously question that either your writer or any one else can accurately assess the ability of the National Society of Professional Engineers to perform in response to the challenging opportunity that has been offered the society by the forward thinking policy advocated and implemented by the AIEE for the coordination of activities of the several engineering organizations in this country for the advancement of the engineering profession.

In the light of the accomplishments of the National Society of Professional Engineers to date since its founding in 1934, I can see no reason to doubt that the society will rise to this occasion and acquit itself nobly in so doing. I would grant that the assignment is one of vast proportions, but as of now we have 42,000 professional engineers as members in the society which makes us second only to the AIEE in numbers. From this nucleus we have what it takes to multiply our numbers and our efforts by geometric expansion thru the development of our potential with the experience, ability, and will-to-win of our membership.

I believe that reasonable men would give the society the benefit of the doubt. They might say "Let's see you do it!" But to make a flat statement decrying the ability of the society to perform appears to me to be unjustified, shortsighted, in bad taste, very unprofessional, and I might add rather unWorldly.

F. Von Voigtlander, PE
1919 Wayne St.
Ann Arbor, Mich.

SALES ASSIGNMENTS

COMPANY STAFFS

Anaconda Wire & Cable Co has announced the following sales promotions: Max Rubenstein, to manager of sales-government agencies; Richard Kellogg, to district manager at Washington, D. C.; Frank Dickey, to manager of sales, OEM accounts, effective August 1; William Gaylord, to San Francisco district manager; Henry Johnson, to district manager of the new sales district at Newark, N. J.; Robert Sullivan, to district manager, Cleveland territory; David T. Werner, manager of the southern plant to be located at Watkinsville, Ga.; Jackson B. West to district manager at Charlotte, N. C.

Orangeburg Manufacturing Co, Inc, has appointed William B. Schutz manager of bituminous pipe sales and Harry N. Dietz manager of fibre conduit sales.

Joseph T. Ryerson & Son, Inc, has named Wilford O. Schwartz sales manager for the St. Louis steel service plant, and Frank W. Ingold sales manager of the Cincinnati steel service plant. Elmer A. Jahnke, Jr, succeeds Ingold as sales representative in the Ohio area.

H. K. Porter Co, Inc, has designated E. G. Counselman as manager of industrial sales with headquarters in New York, and William E. Haines as Washington representative.

Westinghouse Electric Corp's Lamp Division has advanced Leo A. Hansen, Jr, to assistant to the sales manager of the Pacific Coast region . . . New advertising and sales promotion manager for the Atlantic apparatus sales region is William M. Boylan . . . D. E. Warner now heads a distributing district headquarters in Richmond for the new Appliance Sales Division . . . The Supply Co's recently organized headquarters sales management group will have as its general sales manager, apparatus and supply, Francis E. Mefford. Appointed to assist him were the following three product sales managers: Bruce A. Everly, who will handle inside apparatus and supplies; Glen E. Nietfeld, outside apparatus and supplies; and Joseph W. Hartman, lighting and lamps . . . Robert E. Haubold was recently appointed Southwestern regional sales manager of the Air Conditioning Division. A. L. McDonald, Jr, becomes Western regional sales manager.

in the long run... it's O.Z.

Type AX

Provides 4" expansion, contraction movement. Malleable iron head, body Hot Dip Galvanized. Weathertight head sealed by factory-installed high grade graphite packing. Insulating conduit end bushing eliminates cable abrasion. 10 sizes for conduit ½" to 4" diameters.

Type EX

Permits 8" conduit movement. Optional length sleeves, additional cost. Weathertight head sealed by factory-installed high grade graphite packing. Insulating bushings prevent cable abrasion. Hot Dip Galvanized finish. 13 sizes for ½" to 6" conduit diameters.

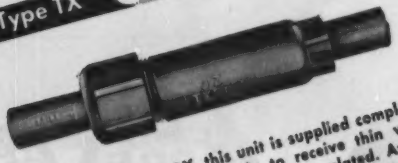
Type EXDS

Compensates for deflection, expansion, contraction. ¾" movement all directions from normal; 30° angular movement. Also used as vibration damper between conduit sections. 10 sizes.

Type EXE

Weathertight end type expansion fitting. Designed for conduit terminating in junction box, where expansion, contraction take place. Supplied complete: locknuts, bushings. Standard finish, Hot Dip Galvanized. 13 sizes.

Type TX



Similar to the Type AX, this unit is supplied complete with extension nipples, ready to receive thin wall couplings. Standard finish is cadmium plated. Available in 6 sizes for conduit ranging from ½" to 2".

for the longer line of EXPANSION FITTINGS

In the long run, no line of conduit is more dependable than its components. When it comes to dependability in expansion fittings, look to O. Z. as the line that measures up! Five basic types provide the dependable answer to your fitting problems in conduit expansion, contraction, and deflection. O. Z. is the dependable line because it's the line with the *right* size, the *right* type, for every requirement!

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IF IT CARRIES CURRENT, KW CARRIES IT!

NEW LAYTEX-RESIN INSULATION GIVES KW CONTROL CABLES FINEST PROTECTION MADE!

Greatest Insulation Advance in 25 Years!

Now with new "Kaiser Master" Control Cables, KW brings you *Laytex®-Resin* . . . the greatest advance in insulation since the introduction of pure-rubber Laytex insulation in 1932.

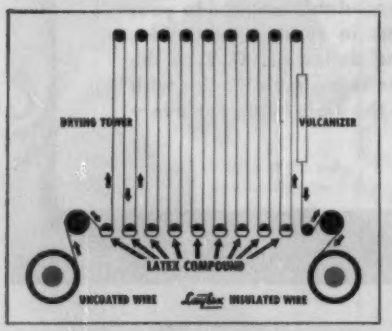
In Laytex-Resin, the synthetic resin conductor covering becomes an integral part of the insulation. The resin is applied in the same dip process as the Laytex, and is fused right into the rubber. This eliminates the need for protective braid covers, which in turn permits greatly reduced cable diameters!

In addition to smaller diameter and resulting lighter weight, Laytex-Resin cables offer all these other advantages over cables with braided conductors:

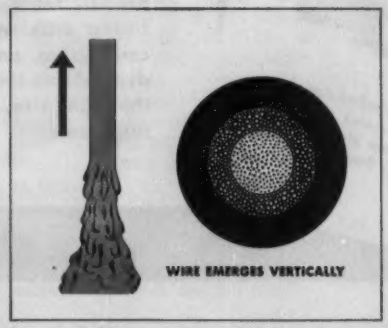
1. **More complete (100 per cent coverage) protection of the insulation.**
2. **Greater protection of the insulation against acids, alkalies, flame, fungus, moisture, oil, ozone and light checking.**
3. **Cover does not fray or wick moisture.**
4. **Splicing and taping made easier.**
5. **Smoother conductor surface.**
6. **More attractive colors (including stripes).**

For a record of dependability in municipalities all over America, KW Laytex-Resin Control Cables are backed up by twenty-five years of perfect service given by their predecessors, Laytex insulated control cables.

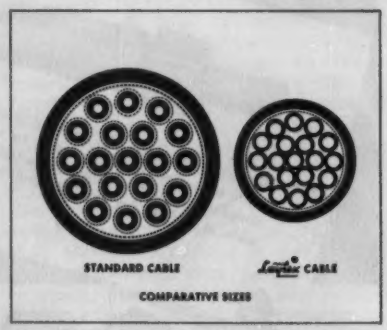
KW "Kaiser Master" Control Cables more than meet the standards set up by I.M.S.A. Specifications No. 16. These cables have tinned or alloy-coated solid copper conductors in accordance with A.S.T.M. requirements. The choice of an overall protective covering for these cables is determined by the customer and is governed by conditions of installation and use.



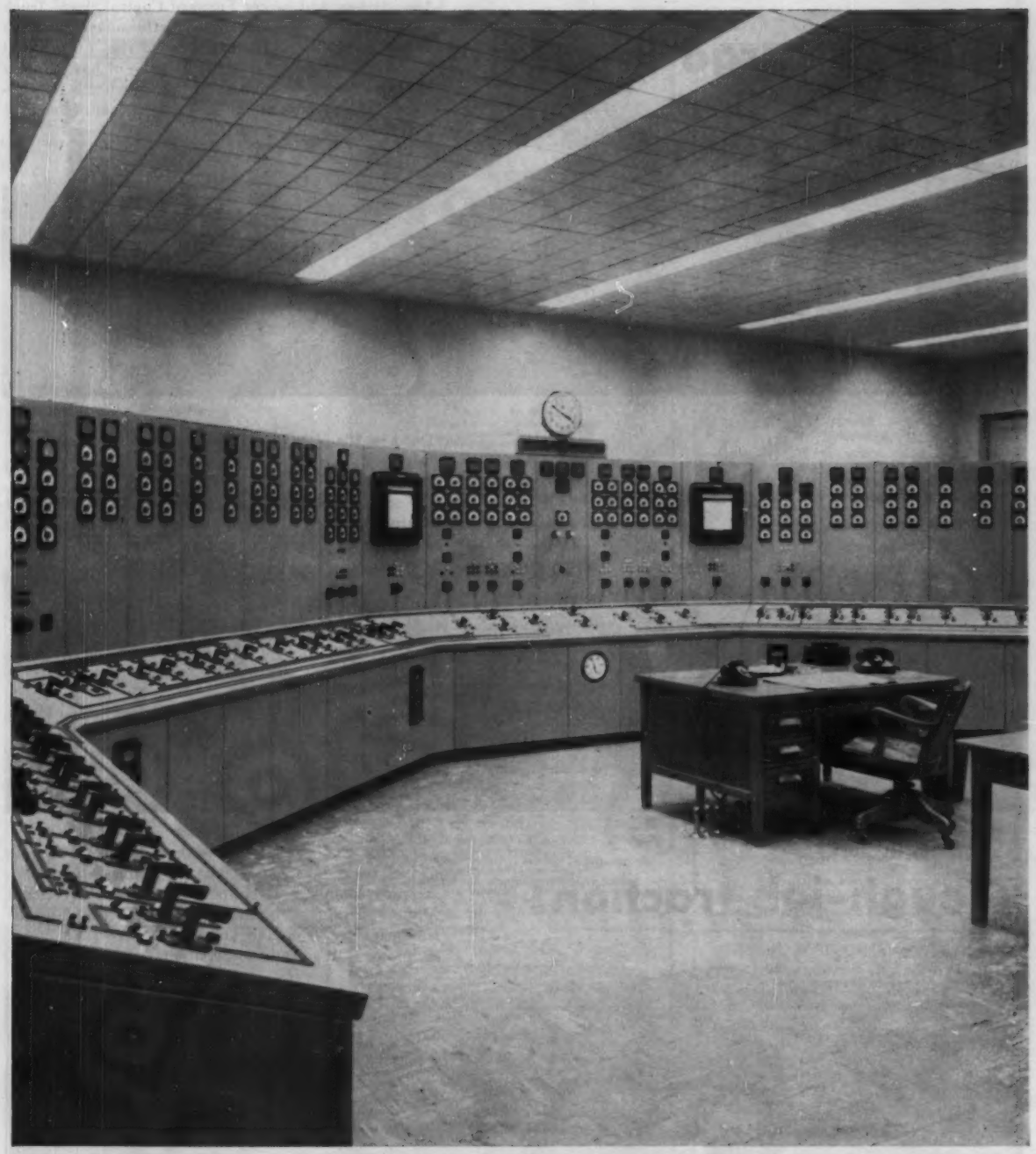
Laytex-Resin is applied to each individual conductor by the dip process diagrammed above. Because the rubber is applied in unmilled form and the resin is bonded directly to it, Laytex-Resin insulation has no "grain"—its physical properties are *uniform in all directions.*



In the dip process, the conductor emerges vertically from the liquid compound, forming the compound in uniform layers around the conductor. This results in a perfectly centered conductor and permits an insulation with thinner walls than are possible with extruded rubber.



Because the wall thickness required with Laytex-Resin is only one-third to one-half that required for conventional insulations, and because braided conductor covers are eliminated entirely, Laytex-Resin makes possible *more wires per conduit* . . . plus reduced weight and increased flexibility.



The properties and the performance demonstrated by KW Laytex and Laytex-Resin Control Cables all add up to unequaled *Dependability*. These cables may be installed (1) in conduits, ducts or trays, (2) as aerial cable on a suitable messenger, or (3) buried in the ground.

For immediate service, or for further information and samples, call the Kaiser Aluminum sales office or the KW distributor listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Bldg., Oakland 12, Calif.; *General Sales Office,* Palmolive Bldg., Chicago 11, Ill.

Kaiser Aluminum

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Another new and bigger Forward Control 'Jeep' Truck —the FC-170—puts a big 9-foot platform stake body on a wheelbase only 103½-inches long. This 7,000-pound GVW workhorse has room for 49 bales of hay, 35 bags of cement, or 60 bushel baskets. And the bed is only 35-inches from the ground for back-saving ease of loading!

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The extra traction of FC-170 4-wheel drive, and its wide 63-inch tread, take you "almost anywhere" with ground-gripping stability. It shifts easily into conventional 2-wheel drive for highway travel. The high-torque Hurricane 6-226 engine delivers real working power at low cost. It's ready for your bigger, tougher jobs!

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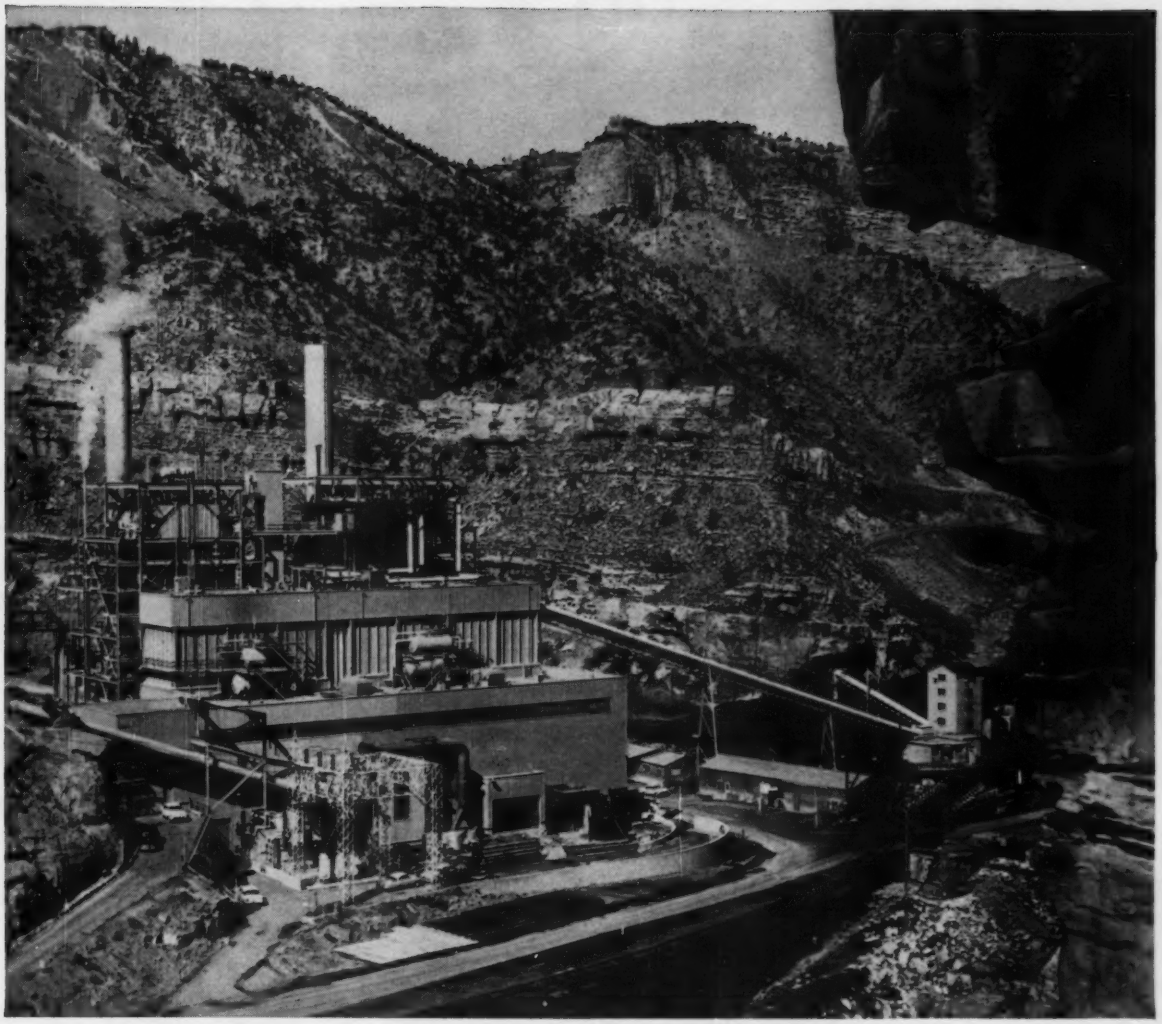

UTAH POWER & LIGHT CO.—Carbon steam-electric plant, Castle Gate, Utah

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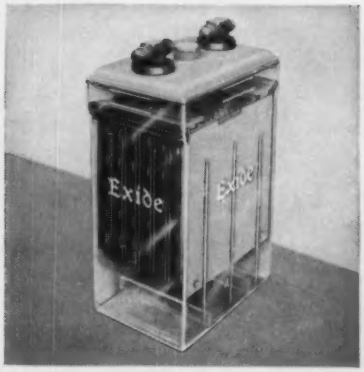

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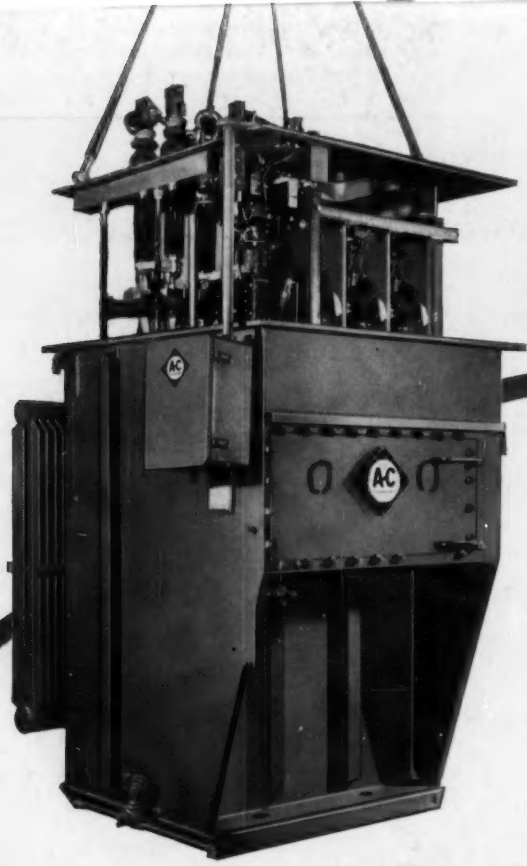

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